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Former Joliet Army Ammunition Plant
Will County, Illinois

Final
2018 Annual Groundwater Monitoring Report

Long-Term Monitoring, Deed Restriction Implementation Plan, and CERCLA Five-Year Review

Prepared For:
U.S. Army Environmental Command under contract with the U.S. Army Corps Of Engineers

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FINAL

2018 ANNUAL GROUNDWATER MONITORING REPORT

LONG-TERM MONITORING, DEED RESTRICTION IMPLEMENTATION PLAN, AND CERCLA FIVE-YEAR REVIEW

FORMER JOLIET ARMY AMMUNITION PLANT
WILL COUNTY, ILLINOIS

June 2019

IEA, Inc./MWH Americas, Inc. Joint Venture (IEA/MWH JV) certifies that, to the best of its knowledge and belief, the technical data delivered herewith under contract W912QR-15-C-0016 is complete, accurate, and complies with all requirements of the contract.

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TABLE OF CONTENTS

Section **Page**

ACRONYMS AND ABBREVIATIONS vii

1.0 INTRODUCTION 1-1
1.1 FACILITY DESCRIPTION AND BACKGROUND 1-2
1.2 NATURAL ATTENUATION MECHANISMS 1-4
1.3 RECORD OF DECISION REQUIREMENTS 1-6
1.4 LONG-TERM MONITORING PLAN 1-6
1.5 HISTORIC DATA RESULTS 1-8

2.0 SITE ACTIVITIES 2-1
2.1 LANDFILL INSPECTIONS 2-1
2.2 GROUNDWATER MONITORING 2-1
2.2.1 Annual Groundwater Monitoring 2-2
2.3 MONITORING WELL ABANDONMENTS 2-3
2.4 INSTITUTIONAL CONTROLS MONITORING 2-4

3.0 RESULTS AND RECOMMENDATIONS 3-1
3.1 SITE L1 (Group 61) 3-3
3.1.1 Groundwater Hydraulics 3-3
3.1.2 Analytical Results 3-4
3.1.3 Groundwater Trend Evaluation 3-6
3.1.4 Recommendations 3-8
3.2 SITE L2 (Explosive Burning Ground) 3-8
3.2.1 Groundwater Hydraulics 3-9
3.2.2 Analytical Results 3-10
3.2.3 Groundwater Trend Evaluation 3-11
3.2.4 Recommendations 3-12
3.3 SITE L3 (Demolition Area) 3-12
3.3.1 Groundwater Hydraulics 3-13
3.3.2 Analytical Results 3-14
3.3.3 Groundwater Trend Evaluation 3-15
3.3.4 Recommendations 3-17
3.4 SITE L14 (Group 4) 3-17
3.4.1 Groundwater Hydraulics 3-18
3.4.2 Analytical Results 3-18
3.4.3 Groundwater Trend Evaluation 3-19
3.4.4 Recommendations 3-20
3.5 SITE M1 (Southern Ash Pile) 3-21
3.5.1 Groundwater Hydraulics 3-21
3.5.2 Analytical Results 3-22
3.5.3 Groundwater Trend Evaluation 3-23
3.5.4 Recommendations 3-27
3.6 MFG GMZ 3-27
3.6.1 Site M6 (TNT Ditch Complex) 3-28

3.6.1.1 Groundwater Hydraulics 3-29
3.6.1.2 Analytical Results 3-30
3.6.1.3 Groundwater Trend Evaluation 3-32
3.6.1.4 Recommendations 3-36
3.6.2 Landfill M13 (Gravel Pit) 3-36
3.6.2.1 Groundwater Hydraulics 3-37
3.6.2.2 Analytical Results 3-38
3.6.2.3 Groundwater Trend Evaluation 3-39
3.6.2.4 Recommendations 3-41
3.7 LANDFILL M11 (Landfill) 3-42
3.7.1 Groundwater Hydraulics 3-42
3.7.2 Analytical Results 3-43
3.7.3 Groundwater Trend Evaluation 3-44
3.7.4 Recommendations 3-46

4.0 SUMMARY OF RECOMMENDATIONS 4-1

5.0 REFERENCES 5-1

LIST OF TABLES

Table No.

1-1 Sample Parameters – October 2018
2-1 Summary of Final Field Parameters
2-2 Monitoring Well Information Table – Manufacturing Area
2-3 Monitoring Well Information Table – Load-Assemble-Package Area
2-4 Surface Water Elevations
3-1 Summary of Analytical Results – Explosives
3-2 Summary of Analytical Results – Target Analyte List Metals
3-3 Summary of Analytical Results – Indicator Parameters
3-4 Summary of Analytical Results – Volatile Organic Compounds
3-5 Summary of Analytical Results – Semivolatile Organic Compounds
3-6 Summary of Groundwater Trends: Estimated Clean-up Times
3-7 Vertical Gradient Calculations
3-8 Proposed Sampling Plan – April 2019
4-1 Summary of Recommendations

LIST OF FIGURES

Figure No.

1-1 Site Location Map
1-2 Groundwater Study Areas and Landfill Sites

3-1 Site Features/Water Table Map - LAP Area Site L1 (October 2018)
3-2 Potentiometric Surface Map - LAP Area Site L1 (October 2018)
3-3 Explosives Detections - LAP Area Site L1 (April and October 2018)
3-4 Site Features/Water Table Map - LAP Area Site L2 (October 2018)
3-5 Potentiometric Surface Map - LAP Area Site L2 (October 2018)
3-6 Explosives Detections - LAP Area Site L2 (October 2018)
3-7 Site Features/Water Table Map - LAP Area Site L3 (October 2018)
3-8 Potentiometric Surface Map - LAP Area Site L3 (October 2018)
3-9 Explosives Detections - LAP Area Site L3 (April and October 2018)
3-10 Site Features/Water Table Map - LAP Area Site L14 (October 2018)
3-11 Potentiometric Surface Map - LAP Area Site L14 (October 2018)
3-12 Explosives Detections - LAP Area Site L14 (October 2018)
3-13 Site Features/Water Table Map - MFG Area Site M1 (October 2018)
3-14 Potentiometric Surface Map - MFG Area Site M1 (October 2018)
3-15 Sulfate Detections - MFG Area Site M1 (April and October 2018)
3-16 Site Features/Water Table Map - MFG Area Sites M3, M4, M5, M6, M7, M8, M13, and Other Areas (October 2018)
3-17 Potentiometric Surface Map - MFG Area Sites M3, M4, M5, M6, M7, M8, M13, and Other Areas (October 2018)
3-18 Explosives and Sulfate Detections - MFG Area Sites M6, M8, M13, and Other Areas (April and October 2018)
3-19 Shallow Potentiometric Surface Map - Manufacturing Area Site M13 Landfill (October 2018)
3-20 Deep Potentiometric Surface Map - Manufacturing Area Site M13 Landfill (October 2018)
3-21 Sulfate Detections - Manufacturing Area Site M13 Landfill (April and October 2018)
3-22 Shallow Potentiometric Surface Map - Manufacturing Area Site M11 Landfill (October 2018)
3-23 Deep Potentiometric Surface Map - Manufacturing Area Site M11 Landfill (October 2018)
3-24 Sulfate Detections - Manufacturing Area Site M11 Landfill (October 2018)

LIST OF APPENDICES

Appendix

A Landfill Inspection Reports
- A1 Post-closure Landfill Inspection Report, June 2018
- A2 Post-closure Landfill Inspection Report, October 2018

B Historical Data Tables
- B1 Summary of Historical Groundwater Results – Explosives
- B2 Summary of Historical Groundwater Results – Metals
- B3 Summary of Historical Groundwater Results – Indicator Parameters
- B4 Summary of Historical Groundwater Results – Volatile Organic Compounds

B5 Summary of Historical Groundwater Results – Semivolatile Organic Compounds

C Data Reports
C1 Data Validation Report
C2 Data Usability Report

D First Order Rate Decay Trend Analysis
D1 Trend Graphs
D2 Estimated Clean-up Time: Example Calculation

ACRONYMS AND ABBREVIATIONS

2017 Report	Final 2017 Annual Groundwater Monitoring Report (IEA/MWH JV, May 2018)
Army	United States Army
2-AT	2-aminotoluene
BNSF	Burlington Northern Santa Fe Railroad
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CO_2	carbon dioxide
COC	contaminant of concern
1,1-DCA	1,1-dichloroethane
1,2-DCA	1,2-dichloroethane
cis-1,2-DCE	cis-1,2-dichloroethene
2,4-D	2,4-Dichlorophenoxyacetic acid
2,4-DNT	2,4-dinitrotoluene
2,6-DNT	2,6-dinitrotoluene
2-A-4,6-DNT	2-amino-4,6-dinitrotoluene
4-A-2,6-DNT	4-amino-2,6-dinitrotoluene
DO	dissolved oxygen
1,3-DNB	1,3-dinitrobenzene
FSP	Final Appendix A – 2017 Field Sampling Plan Update (IEA/MWH JV, June 2017)
ft	foot/feet
ft/yr	feet per year
GMZ	groundwater management zone
GOU	Groundwater Operable Unit
GRU	Groundwater Remedial Unit
H_2O	water
HMX	high melting explosive
IAC	Illinois Administrative Code
IC	institutional control
IEA/MWH JV	IEA/MWH Joint Venture
IEPA	Illinois Environmental Protection Agency
in.	inch
JOAAP	former Joliet Army Ammunition Plant

LAP	Load-Assemble-Package Area
LOQ	limit of quantitation
LTM	long-term monitoring
LTM Plan	Final Long-term Monitoring Plan for Environmental Remediation Services (MWH/TolTest, March 2010)
MFG	Manufacturing Area
mg/L	milligrams per liter
ml	milliliters
ml/min	milliliters per minute
MNA	monitored natural attenuation
MNTP	Midewin National Tallgrass Prairie
MS/MSD	matrix spike/matrix spike duplicate
MWH	MWH Americas, Inc.
NB	nitrobenzene
NPL	National Priority List
2-NT	2-nitrotoluene
OD	outside diameter
ORP	oxidation-reduction potential
Other Areas	refers to an area in the northwest part of Manufacturing Area where compliance monitoring wells for the Manufacturing Area GMZ are located
OU	operable unit
PCE	tetrachloroethene
PL 104-106	Illinois Land Conservation Act of 1995, Public Law 104-106, Div. B, Title 2901-2932, 10 February 1996
ppm	parts per million
PVC	polyvinyl chloride
QAPP	Final Appendix B - 2017 Quality Assurance Project Plan Update (IEA/MWH JV, July 2017)
RA	remedial action
RDX	Royal Demolition Explosive
Report	2018 Annual Groundwater Monitoring Report
RG	Remedial Goal
RI	Remedial Investigation
1998 ROD	Record of Decision for the Soil and Groundwater Operable Units on the Manufacturing and Load-Assemble-Package Areas, National Priorities List Sites (U.S. Army, October 1998)

Site L1	Group 61
Site L2	Explosive Burning Grounds
Site L3	Demolition Area
Site L14	Group 4
Site M1	Southern Ash Pile
Site M3	Flashing Grounds
Site M4	Lead Azide Area
Site M5	Tetryl Production Area
Site M6	TNT Ditch Complex
Site M7	Red Water Area
Site M8	Acid Manufacturing Area
Site M11	Landfill
Site M13	Gravel Pit
SOP	standard operating procedure
SOU	Soil Operable Unit
SpC	specific conductivity
SVOC	semivolatile organic compound
TAL	target analyte list
TAT	2,4,6-triaminotoluene
TNB	1,3,5-trinitrobenzene
TNT	2,4,6-trinitrotoluene
TOC	top of casing
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
USACE	United States Army Corps Of Engineers
USAEC	United States Army Environmental Command
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
UXO	unexploded ordnance
VOC	volatile organic compound

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1.0 INTRODUCTION

This 2018 Annual Groundwater Monitoring Report (Report) has been prepared by IEA, Inc./MWH Americas, Inc. Joint Venture (IEA/MWH JV) for environmental services at the former Joliet Army Ammunition Plant (JOAAP) on behalf of the United States Army Environmental Command (USAEC) under contract with the United States Army Corps Of Engineers – Louisville District (USACE). This work was executed under Firm Fixed Price Contract No. W912QR-15-C-0016.

This Report presents 2018 groundwater and surface water quality data for the long-term monitoring (LTM) program of the Groundwater Operable Unit (GOU) and landfill inspection documentation for the Soil Operable Unit (SOU) at JOAAP conducted in response to the *Record of Decision for the Soil and Groundwater Operable Units on the Manufacturing and Load-Assemble-Package Areas* (U.S. Army, 1998; 1998 ROD) for JOAAP. The remedy that was selected for the GOU sites at JOAAP was monitored natural attenuation (MNA). As a function of the MNA remedy for the Groundwater Remedial Units (GRU), LTM is required. This requirement is intended to satisfy three primary objectives:

1. Monitor contaminant concentration reductions and plume migration;
2. Verify containment of contaminant concentrations greater than the Remedial Goal (RG) within the groundwater management zones (GMZs); and
3. Evaluate the effectiveness of SOU remedial action (RA) and MNA for the GOU remedy.

These objectives are being met through implementation of the LTM program.

In addition to the GOU, SOU RAs included the construction of three landfills at Sites L3 (Demolition Area), M11 (Landfill), and M13 (Gravel Pit). However, removal of Landfill L3 was completed in August 2016. Landfill inspections are required quarterly at Landfill M13 and required annually at Landfill M11 (following the initial five years of quarterly inspections, per the *Final Long-term Monitoring Plan for Environmental Remediation Services* (LTM Plan [MWH/TolTest, March 2010]) to determine if the remedies continue to function as designed. The Post-closure Landfill Inspection Report for the third quarter (conducted in June 2018) for Landfill M13 and the Post-closure Landfill Inspection Report for the fourth quarter (conducted in October 2018) for Landfills M11 and M13 are included in Appendix A. The Post-closure Landfill Inspection Report for the first (conducted in February 2018) and the second (conducted in April 2018) quarters are included in the *Final 2017 Semi-annual Groundwater Monitoring Report* (IEA/MWH Americas, Inc. Joint Venture [IEA/MWH JV], October 2018).

These objectives are being met through implementation of the LTM program.

The objective of this Report is to provide a review of the groundwater and surface water quality sampling results from 2018 and provide documentation of landfill inspections from June and October 2018. Historical analytical data tables are included in Appendix B, and

2018 data are included in tables presented in this Report. Water table and potentiometric surface maps for the April 2018 sampling event are included in the *Final 2018 Semi-annual Groundwater Monitoring Report* (IEA/MWH JV, October 2018).

1.1 FACILITY DESCRIPTION AND BACKGROUND

JOAAP is a former United States Army (Army) munitions production facility located on approximately 37 square miles (23,912 acres) of land in Will County, Illinois (Figure 1-1). The former facility is located approximately 60 miles southwest of Chicago and 14 miles south of Joliet, Illinois. As shown on the Groundwater Study Areas and Landfill Sites Map (Figure 1-2), the JOAAP property is divided into two main functional areas: the Manufacturing Area (MFG), west of Route 53, and the Load-Assemble-Package Area (LAP), east of Route 53. The facility has been described in detail in Section 1.1 of the LTM Plan.

The MFG, covering approximately 15 square miles, is where the chemical constituents of munitions, propellants, and explosives were produced. The production facilities were generally located in the northern half of the MFG. In the southern half of the MFG there was an extensive explosives storage facility. The LAP, covering approximately 22 square miles, is where munitions were loaded, assembled, and packaged for shipping. The LAP contained munitions filling and assembly lines, storage areas, and a demilitarization area.

JOAAP was constructed during World War II. The production output varied with the demand for munitions. Although the plant was used extensively during World War II, all production of explosives halted in 1945. At that time, the sulfuric acid and ammonium nitrate plants were leased out, and the remaining production facilities were put in layaway status. The installation was reactivated during the Korean War, and again during the Vietnam War. Production gradually decreased until it was stopped completely in 1977.

Hazardous wastes were generated and released into the environment in several ways. Process waters used in the production and handling of 2,4,6-trinitrotoluene (TNT) and other compounds were discharged into drainage systems. Buildings and equipment were periodically washed to remove explosive residues. Most of these wastewaters leached into the ground or flowed into local surface water and creeks. Later, process water incineration or industrial wastewater treatment produced ash or explosives residue that accumulated over time. Ash from the incineration of production by-products was stored in landfills on site. Equipment and demolition materials were flashed (burned) to remove residues. Fire training areas, used to keep fire and safety personnel suitably prepared, introduced contaminants to soil and groundwater. Leaks and spills occasionally occurred in the storage and handling of oils and other liquids. Wastes and unusable explosives and munitions were burned or detonated. In addition, munitions were tested, leaving some residuals in soil at the test sites. Vehicle and equipment maintenance, transformer leaks, and the handling of pesticides introduced further contamination to the soil.

Wastes generated during production activities resulted in environmental contamination at various sites around JOAAP. Because of this contamination, the United States Environmental Protection Agency (USEPA) placed the MFG on the National Priority List (NPL) on 21 July 1987 and the LAP on the NPL on 31 March 1989.

The contaminated media identified at JOAAP were divided into two operable units (OUs) to aid in the development and evaluation of remedies. The SOU consists of sites where contaminated soils, sediments, and debris were identified. The GOU consists of sites where contaminated groundwater was identified. Surface water was determined to pose no risk to human health and the environment, and therefore is not addressed further as a contaminated media. However, surface water discharge is a major component of the shallow groundwater system, and localized detections of explosives may occur near contaminated groundwater sites. For this reason, surface water is relevant to the GOU.

The Illinois Land Conservation Act of 1995, Public Law 104-106, Div. B, Title 2901-2932, 10 February 1996 (PL 104-106), states that the Army will transfer JOAAP land to various federal, local, and state jurisdictions. Transfer of land is occurring incrementally as it is remediated and is deemed appropriate. Substantial land area at JOAAP is not contaminated. Transfer activities for the uncontaminated land have occurred and some are still underway. After remaining potential hazards to human health and the environment are addressed under the SOU and these properties are found suitable for transfer under PL 104-106 and the Comprehensive Environmental Response Compensation and Liability Act of 1980 (CERCLA), the Army will prepare documentation for transfer.

As of 2018, according to information received from the Will County Supervisor of Assessments, the distribution of JOAAP land through these incremental transfers is approximately 17,629 acres to the United States Department of Agriculture (USDA) for establishing the Midewin National Tallgrass Prairie (MNTP); 1,009 acres to the Department of Veterans Affairs to establish a Veterans Cemetery; 455 acres to Will County, Illinois to establish the Will County Landfill; and 2,219 acres to the State of Illinois to establish two industrial parks. There were approximately 3 acres of the Elwood Maple Hill Cemetery which were located within the JOAAP boundary that were never part of JOAAP and are not included in these total acreages. The Army maintains control over approximately 1,315 acres.

Where groundwater contamination is present within areas to be transferred, the Army has included institutional controls (ICs) in the transfer documents to prevent exposure to contaminants in soil and groundwater and limit groundwater pumping to prevent changes in the natural groundwater flow patterns through any means. These ICs will help to limit the spread of the remaining contamination in groundwater and will remain in effect with the land until removed by mutual agreement of the Army, USEPA, Illinois Environmental Protection Agency (IEPA), and the current landowner.

1.2 NATURAL ATTENUATION MECHANISMS

The selected remedial action for the GOU is remediation by natural attenuation. The following discussion provides a brief overview of the physical, chemical, and biological criteria, which are most directly linked to natural attenuation mechanisms. A more detailed assessment of the site-specific criteria used to evaluate natural attenuation at JOAAP is provided in the LTM Plan.

Aerobic and anaerobic biodegradation of explosive compounds has been previously demonstrated. There has been a significant amount of information developed on the breakdown pathways for TNT in particular. The electrophilic nature of this compound has favored reductive reactions over oxidation. Aerobic degradation pathways typically yield partially reduced nitroso and hydroxylamino compounds that form recalcitrant azoxy compounds through oxidative coupling. Anaerobic reduction of TNT follows one of two sequential pathways; from either 4-amino-2,6-dinitrotoluene (4-A-2,6-DNT) or 2-amino-4,6-dinitrotoluene (2-A-4,6-DNT) to 2,6-dinitrotoluene (2,6-DNT) to 2-amino-6-nitrotoluene to 2-nitrotoluene (2-NT) to 2-aminotoluene (2-AT) to toluene. Ultimately, toluene is mineralized to carbon dioxide (CO_2) and water (H_2O). Some researchers report the end product for anaerobic degradation to be 2,4,6-triaminotoluene (TAT). The compound TAT has been reported to be highly unstable and is also irreversibly bound to soil under anaerobic and subsequent aerobic conditions.

Mineralization of toluene can occur under both aerobic and anaerobic conditions. In an aerobic environment, toluene is oxidized resulting in ring fission and subsequent rapid degradation through a series of steps where aldehydes and acids are formed. These by-products are quickly mineralized. There are at least four pathways through which toluene can be mineralized under anaerobic conditions. The anaerobic degradation of toluene typically proceeds through a series of steps resulting in the formation of alcohols, aldehydes, and acids prior to mineralization. Evidence of toluene production and subsequent mineralization is often undetected at sites because the biologically mediated reactions occur rapidly without the accumulation of by-products (Cookson, 1995).

High melting explosive (HMX) has been demonstrated to degrade by abiotic, anaerobic, and aerobic mechanisms. Abiotic degradation by photolysis has led to the formation of nitrate, nitrite, and formaldehyde (Gorontzy, 1994). Anaerobic degradation of HMX has led to the formation of mono-nitroso and di-nitroso derivatives and potentially can yield a small concentration of methanol. These breakdown products can be difficult if not impossible to analyze in field samples, especially in the low concentrations one would expect to find at JOAAP. Aerobic degradation of HMX can be achieved with similar breakdown products resulting (Kaplan, 1993).

Royal Demolition Explosive (RDX) has been demonstrated to degrade by abiotic, anaerobic, and aerobic mechanisms. Abiotic degradation by photolysis has led to the formation of a mono-nitroso derivative, nitrate, nitrite, ammonium, formaldehyde, and various amides, amines, and acids. Aerobic degradation of RDX has led to the formation of mono-nitroso

and di-nitroso derivatives. Anaerobic degradation of RDX can be achieved with similar breakdown products as well as tri-nitroso triazines, hydrazine, dimethylhydrazine, formaldehyde, and methanol (Gorontzy, 1994). These breakdown products can be difficult if not impossible to analyze in field samples, especially in the low concentrations one would expect to find at JOAAP.

Tri-, di-, and nitrobenzene (NB) have been demonstrated to degrade by anaerobic mechanisms. The degradation pathway can involve the formation of a nitrosobenzene compound, a hydroxylaminobenzene, and 2-aminophenol. If the system becomes aerobic, the 2-aminophenol is transformed to 2-aminomuconic semialdehyde, which can be further degraded (Haigler, 1996).

The processes affecting the natural attenuation of contaminants in groundwater are advection, dispersion, diffusion, sorption, and biodegradation. Physical attenuation processes reduce the contaminant concentrations and their overall toxicity in groundwater. Bioattenuation includes biological and chemical processes that destroy contaminant mass. Reduction in contaminant mass will eventually result in an overall decrease in concentrations and plume extent.

Proving that bioattenuation is occurring at a site is typically based on collection of site-specific information related to geologic and hydrogeologic characterization, the extent and distribution of contaminants, and the collection and analysis of specific chemical and physical attributes of the aquifer matrix and groundwater. Several investigators have developed lines of evidence which they believe can adequately demonstrate that bioattenuation is occurring at a site (Rifai et al., 1995; Wiedemeier et al., 1995, 1996).

Rifai et al. (1995) states that three indicators of MNA should be developed from the site characterization data. The three indicators are: (1) compound disappearance demonstrating the decrease in contaminant concentrations as a function of time and distance from the source; (2) loss of electron donors; and (3) presence of degradation products and the accumulation of other indicator parameters of biodegradation.

The key geologic variables with the greatest potential to impact natural attenuation are the lateral and vertical heterogeneity of each aquifer. A high degree of lateral and vertical heterogeneity within an aquifer causes varying hydraulic conductivity and hydraulic gradients. As groundwater velocities change, contaminant transport rates change; this complicates the evaluation of natural attenuation mechanisms.

Changes in contaminant concentration with time will be used to evaluate the effectiveness of natural attenuation mechanisms. If contaminant reduction does not proceed at a suitable rate, contingency options may be required. These options will be discussed on a site-specific basis.

1.3 RECORD OF DECISION REQUIREMENTS

The 1998 ROD specified general groundwater monitoring requirements. These requirements were based on information obtained during the Remedial Investigation (RI) and did not have the additional information provided by the predesign investigation completed in 1998 or subsequent remedial actions completed at JOAAP. As such, the Army applied subsequent site data as well as historical data to arrive at site-specific LTM locations and analytes, which were included in the LTM Plan.

Based on the objectives presented in Section 1.2 of the LTM Plan and as an extension of the 1998 ROD, several types of monitoring are required. These include:

- Collection of groundwater samples to evaluate contaminant concentrations;
- Collection of surface water samples where groundwater discharges to surface water features to evaluate surface water contaminant concentrations;
- Collection of depth to water measurements to evaluate groundwater flow;
- Documentation and evaluation of source removal or surface disturbing activities;
- Documentation of changes in surface water features, impoundments, or conveyances; and
- Evaluation of evidence concerning improper water withdrawal affecting contaminant migration.

1.4 LONG-TERM MONITORING PLAN

Monitoring activities are required pursuant to the decision documents developed for the various contaminated sites found at JOAAP. The LTM Plan was produced to present LTM activities for the GOU and required SOU maintenance activities. The LTM Plan includes activities associated with long-term maintenance of the remedies selected for JOAAP. The objective of the LTM Plan was to provide a sufficiently detailed description of the monitoring strategy and process and to establish realistic expectations for execution of the LTM program on the part of all stakeholders. With respect to the latter objective, it is the intent of the LTM Plan to establish both the actions to be taken in the event of various sampling outcomes and the set of conditions required to reduce and eventually discontinue long-term monitoring efforts where practicable. As such, it includes sample collection and analysis of groundwater and surface water, surveillance of the landfill cap condition, access restrictions at landfills, and surveillance of land use restrictions and other ICs implemented on an installation-wide basis.

Section 3.1 of the LTM Plan summarizes the GMZs and monitoring well designations, and discusses the decision tree for interpretation of groundwater quality results and the logic for optimizing the LTM program. Section 3.2 of the LTM Plan discusses IC monitoring required as part of the MNA remedy. The *Final 2018 Annual Summary Report Site Wide Deed*

Restriction Implementation (IEA/MWH JV, December 2018) summarizes the results of the IC monitoring conducted in 2018.

The LTM program is presented in Section 4.0 of the LTM Plan, which includes a discussion of site-specific LTM programs for the GMZs and landfills, monitoring well installations, abandonments, monitoring schedules, requirements for IC monitoring, and reporting schedules. Tables 1 through 8 of the *Final Appendix A - 2017 Field Sampling Plan Update* (FSP; IEA/MWH JV, June 2017]) of the LTM Plan provide specific information about the current monitoring requirements at each site. However, it is expressly presented that the LTM program included in the original LTM Plan will likely change with changing conditions over time. Therefore, the LTM Plan sampling tables were consolidated into a single table (Table 1-1) that is continually updated based on groundwater monitoring results and periodic reviews. Additionally, the changes to the LTM program based on results and the conditions set in the LTM Plan are summarized in Section 4 – Recommendations.

The LTM Plan provides a site-specific evaluation of the natural attenuation remedial option that is being applied to all GOU sites. The purpose of the LTM Plan is to:

- Describe the process by which data will be collected and analyzed;
- Determine if remedies in place at JOAAP are protective of human health and the environment;
- Describe the nature of monitoring results that, if observed, would indicate further action be taken because the remedy does not appear to be sufficiently protective;
- Prescribe the conditions under which certain monitoring activities may be terminated; and
- Provide a detailed description of activities to monitor the GOU natural attenuation RA.

Section 5 of the LTM Plan describes reporting requirements for LTM activities. The LTM Plan reporting schedule requires the following:

- Submittal of a semi-annual report that presents the results of the first and second quarterly landfill inspection for Landfill M13, and the semi-annual sampling event with minimal data analysis; and
- Submittal of an annual report that presents the results of the third and fourth quarterly landfill inspections for Landfill M13, the annual inspection of Landfill M11, and the annual sampling event with detailed evaluation of trends in groundwater data.

The landfill inspection schedule, identified in the LTM Plan, has been implemented with Landfill M11 inspections being reduced to annual only, starting in 2015, after having completed five years of quarterly inspections, in accordance with the LTM Plan. The current schedule suggests quarterly landfill inspections will generally be conducted in February (first quarter, Landfill M13), April (second quarter, Landfill M13), July (third quarter, Landfill M13), and October (fourth quarter, Landfills M11 and M13) of each year. In 2018,

the first quarterly inspection was conducted in February at Landfill M13, the second quarterly inspection was conducted in April at Landfill M13, the third quarterly inspection was conducted in June at Landfill M13, and the fourth quarterly inspection was conducted in October at Landfills M11 and M13. Additionally, the landfill caps were mowed in June and October at Landfills M11 and M13; this included fence-to-fence mowing.

The LTM Plan also provides for a CERCLA five-year review of the GOU natural attenuation remedy and SOU remedy, as required by the 1998 ROD. Five-year reviews are completed to evaluate the effectiveness of the GOU and SOU remedies and, if necessary, provide recommendations to modify the remedy to make it more effective. The Final First Five-Year Review Reports for the SOU and GOU were submitted in July and August 2004, respectively. The Final Second Five-Year Review Reports for the SOU and GOU were submitted in April 2009. The Third Five-Year Review Report was consolidated into one document for both the SOU and GOU and was submitted Final in August 2015. Subsequent Five-Year Review Reports will continue to include the GOU and SOU in one consolidated document. The Fourth Five-Year Review is due in September 2019.

1.5 HISTORICAL DATA RESULTS

Historical groundwater quality sampling results from the sampling round conducted immediately prior to completion of the individual site RAs (where available) through 2018 are presented in tabulated form in Appendix B of this Report. Specifically, Appendix B1 contains explosive compound results, Appendix B2 contains target analyte list (TAL) metals results, Appendix B3 contains inorganic indicator parameter (nitrate and sulfate) results, Appendix B4 contains volatile organic compound (VOC) results, and Appendix B5 contains semivolatile organic compound (SVOC) results. The historical tables contain data for monitoring wells that are included in the current LTM program for compounds that have been detected during groundwater monitoring activities conducted at JOAAP. These data provide the basis for evaluating concentration trends in the data and are incorporated into time vs. concentration plots to assist in the evaluation of the natural attenuation of constituents at JOAAP.

2.0 SITE ACTIVITIES

This section provides a summary of the LTM Plan requirements, the groundwater monitoring activities at each of the GOUs, and the SOU RA landfill mowing and inspections.

2.1 LANDFILL INSPECTIONS

Post-closure monitoring requirements for Landfills L11 and M13 are mandated by Illinois Administrative Code (IAC) Title 5, Subtitle G, Chapter 1, Subchapter c, Part 724, Subpart G for 15 years at Landfill M13 and 30 years at Landfill M11. The LTM Plan states that the M11 Landfill cover will be inspected quarterly for the first five years and annually for 25 years, and the M13 Landfill cover will be inspected quarterly. The inspection at Landfill M13 for the third quarter was conducted in June 2018, and the inspections at Landfills M11 and M13 for the fourth quarter were conducted in October 2018. The landfill inspection reports are included in Appendix A.

From 1 through 3 October 2018 the landfill caps at M11 and M13 were mowed, the edge of the rip rap aprons were mowed, and the areas within the perimeter fences were also mowed. Mowing was completed to a height of approximately 4 to 6 inches. Photos of Landfill M13 from the June 2018 inspection are included in the June Landfill Post-closure Inspection Report included in Appendix A1 and photos of Landfills M11 and M13 from the October 2018 inspections are included in the October Landfill Post-closure Inspection Report included in Appendix A2.

2.2 GROUNDWATER MONITORING

This section provides a summary of the field activities undertaken to conduct the annual groundwater and surface water monitoring at GOU and SOU sites. Site L2 (Explosive Burning Grounds) is no longer sampled during the April semi-annual sampling event as recommended in the 2009 Annual Report based on Section 4.1.2.5 of the LTM Plan. Site L14 (Group 4) is no longer sampled during the April semi-annual sampling event as recommended in the 2010 Semi-annual Report based on Section 4.1.4.5 of the LTM Plan. Landfill M11 (Landfill) is no longer sampled during the April semi-annual sampling event as recommended in the 2011 Annual Report based on Section 4.2.2.5 of the LTM Plan.

The measurement of monitoring well groundwater elevations was accomplished using an electronic water level indicator. Depth to water was measured from a datum mark on the top of casing (TOC) of each monitoring well. All measurements were taken to an accuracy of +/- 0.01 foot (ft).

In accordance with the standard operating procedure (SOP) for low-flow sampling, monitoring wells were purged and sampled using low-flow sampling techniques at a flow rate of approximately 250 milliliters per minute (ml/min). Dedicated ¼-inch (in.) outside-diameter (OD) polyethylene and silicon tubing is installed in each monitoring well.

At locations where there have been previous recent detections of organic compounds, the polyethylene tubing was replaced with Teflon™-lined polyethylene tubing. The polyethylene tubing was connected with silicon tubing to a variable speed peristaltic pump. During purging, the pump discharge tube was attached to a multi-probe water quality meter equipped with a flow-through cell. The water quality meter was equipped with probes for measuring groundwater/surface water field parameters including temperature, pH, specific conductivity (SpC), oxidation-reduction potential (ORP), and dissolved oxygen (DO). The water quality meters were calibrated daily in accordance with the FSP and the manufacturer's instructions.

Measurements of field parameters were taken at two-minute intervals and recorded on Groundwater Sampling Forms. Purging of each monitoring well was considered complete when field parameters stabilized over three successive measurements to within approximately 10 percent (varies by parameter, see FSP in the LTM Plan). The final stabilized readings are summarized in Table 2-1. Upon stabilization of the field parameters, the required samples were collected from the discharge tube of the pump into laboratory-supplied containers after disconnecting the flow-through cell.

Samples were collected in laboratory-supplied containers for explosive compounds in one-liter unpreserved amber glass bottles, TAL metals in 250 milliliter (ml) nitric acid preserved polyethylene bottles, inorganic parameters nitrate and sulfate each in separate 250 ml unpreserved polyethylene bottles, VOCs in 40 ml hydrochloric acid preserved glass vials, and SVOCs in one-liter unpreserved amber glass bottles. Samples collected for inorganic parameters (TAL metals, nitrate, and sulfate) were field filtered using high-capacity 0.45 micron in-line cartridge filters. Samples were analyzed by Shealy Environmental Services, Inc., West Columbia, South Carolina in accordance with the *Final Appendix B - 2017 Quality Assurance Project Plan Update* (QAPP; IEA/MWH JV, July 2017) of the LTM Plan.

2.2.1 Annual Groundwater Monitoring

The annual groundwater sampling event for 2018 was conducted from 1 through 11 October 2018 by IEA/MWH JV. Water levels were measured at a total of 129 monitoring wells and 4 surface water locations at JOAAP. A total of 37 monitoring wells and 1 surface water location were sampled at the MFG, and 15 monitoring wells and 3 surface water locations were sampled at the LAP, as summarized in Table 1-1.

The measurement of the monitoring well water levels was accomplished using techniques discussed in Section 2.1. Surface water elevations are determined by referencing to the known elevations of nearby benchmarks using a level and rod, except at Site M1 (Southern Ash Pile) where direct measurement from the bridge with a water level indicator was completed. All gauging and surveying measurements were taken to an accuracy of +/- 0.01 ft. All surface water locations contained water during measurement and sampling activities. Groundwater elevations are summarized in Table 2-2 for the MFG and Table 2-3 for the LAP. Surface water elevations are summarized in Table 2-4. Gauging and surveying activities for individual sites were completed within a 24-hour period.

Groundwater sampling was conducted in accordance with the FSP, as described above. Surface water samples were collected by directly immersing the sample container into the surface water body to fill the bottle. Where filtration was required for sulfate (Site M1), a peristaltic pump with tubing placed directly in the surface water body was used for sample collection.

Blind duplicate samples were collected at a rate of 10 percent (1 per 10) for each analyte sample total. The majority of the duplicate samples were collected from monitoring wells that had previous analyte detections. Duplicate samples were collected from six monitoring wells in the LAP and MFG. Details concerning field duplicates are as follows:

Duplicate Sample Number	Monitoring Point Sampled	Site	Sample Date	Analyte
MW994	MW126R	M13	10/9/2018	VOCs, SVOCs, Explosives, TAL Metals, Nitrate, and Sulfate
MW995	MW362	M13	10/9/2018	VOCs, SVOCs, Explosives, TAL Metals, Nitrate, and Sulfate
MW996	MW212R	M6	10/8/2018	Explosives
MW997	MW412	L3	10/6/2018	Explosives
MW998	MW404	L2	10/4/2018	Explosives
MW999	MW231	M1	10/3/2018	Sulfate

Matrix spike/matrix spike duplicate (MS/MSD) samples were collected at a rate of 5 percent (1 per 20) for each analyte sample total.

Data was validated with Level III data validation, with 10 percent of the samples receiving Level IV validation. Based on the results of the validation, a Data Validation Report is included in Appendix C1, and a Data Usability Report is included in Appendix C2.

2.3 MONITORING WELL ABANDONMENTS

During April and July 2018, 40 monitoring wells were abandoned. Monitoring wells proposed for abandonment were summarized in Table 1 of the *Final 2018 Work Plan Addendum - Monitoring Well Abandonments* (IEA/MWH JV, March 2018). All abandonments were completed in accordance with the FSP. Documentation for the monitoring well abandonments is summarized in Table C-1 and well abandonment forms are included in Appendix C of the *Final 2018 Semi-annual Groundwater Monitoring Report* (IEA/MWH JV, October 2018).

Will County Department of Public Health was notified of the proposed monitoring well abandonments greater than 48 hours prior to the scheduled abandonments and the Monitoring Well Abandonments Documentation was provided to them within 30 days following completion of the abandonments.

2.4 INSTITUTIONAL CONTROLS MONITORING

The remedies selected for all areas of JOAAP do not allow unrestricted use of the property or underlying groundwater. Restrictions on use of groundwater are limited for the GMZs, and annual certification that the restrictions are being followed for each GMZ is required. Land use restrictions over and above those associated with groundwater use apply wherever waste or contamination has been left in place at levels that pose an unacceptable risk without some form of ICs. Some of those areas include the two landfills (M11 and M13) with associated restrictions with annual certification. For all other areas with institutional controls, there is a need for similar annual certification that the deed restrictions remain in effect and being followed. Annual certifications are completed separate from this Report.

During landfill inspections conducted in June and October 2018, there were no observations of intrusive soil activities, construction, or improper use of groundwater which would affect the GOU or SOU remedies at Landfills M11 or M13.

3.0 RESULTS AND RECOMMENDATIONS

Groundwater management zones are three-dimensional areas containing groundwater being managed to mitigate impairment according to the IAC. The GMZs comprise both the glacial drift and shallow bedrock (Silurian Dolomite) aquifer and are bounded at depth by a confining shale unit (Maquoketa Shale). The GMZs were established with acceptance of the 1998 ROD. Any future modification of GMZ boundaries will have to be mutually agreed upon by the Army, USEPA, and IEPA. Groundwater monitoring wells and surface water collection points located inside and/or near the borders will be used to monitor contaminant plumes. Site-specific plans for GMZs for GOU sites are discussed in Sections 3.1 through 3.7 of this Report.

In 2018 groundwater and surface water samples were collected during the semi-annual sampling event conducted in April and the annual sampling event conducted in October. Samples were analyzed for one of more of the following parameters: explosive compounds, TAL metals, indicator parameters (nitrate and sulfate), VOCs, and SVOCs. Analytical results from 2018 sampling event for explosive compounds, TAL metals, indicator parameters (nitrate and sulfate), VOCs, and SVOCs are summarized in Tables 3-1 through 3-5, respectively. Sites L2, L14, and M11 are not sampled during the semi-annual sampling event as described in Section 2.2. This section provides a site-specific presentation of the monitoring well gauging and groundwater and surface water quality sampling results. The discussions are arranged by the GMZs into which each of the sites is grouped. This provides an ability to discuss the contaminant detections in relation to each of the GMZ boundaries.

Each site in Section 3 is organized into the following subsections:

General Site Introduction: General site-specific background information is presented.

Groundwater Hydraulics: Site monitoring wells, surface water sampling locations, and water elevation measurements are presented for the water table and potentiometric surface (generally in the bedrock). For groundwater hydraulic purposes, monitoring wells are designated as overburden monitoring wells, combination overburden/bedrock monitoring wells, or bedrock monitoring wells. This designation indicates in which aquifer(s) the monitoring well is screened. When possible, discussions include the relationship between groundwater flow direction and contaminant migration.

Analytical Results: Figures are presented for contaminant detections observed during the semi-annual and annual sampling events conducted in April and October 2018, respectively. For groundwater quality discussions, monitoring wells and surface water sampling points are designated as in-plume, early warning, or compliance points; and at landfill sites as upgradient or downgradient. These designations are included in the LTM Plan and are based on where the sampling point is located relative to historical groundwater detections, site GMZ, and/or site features.

Analytical data from 2018 sampling are included in the discussion of analytical results. Contaminant concentrations that are greater than site RGs are included in the discussion even if there is not a notable change in the analytical data for that constituent.

Groundwater Trend Evaluation: Each annual report includes figures that show selected contaminant concentrations vs. time plots to evaluate temporal trends in groundwater quality while assessing the effectiveness of natural attenuation mechanisms at each of the sites. Where possible, monitoring wells with established groundwater quality trends are displayed in chart format. For some sites, monitoring well(s) with the highest contaminant concentration greater than RGs are preferentially selected for this analysis if more than one monitoring well is available at a given site. Furthermore, within the selected monitoring wells, compounds with the greatest concentrations relative to RGs provide conservative data sets from which reduction rates are used to estimate site clean-up times. To provide as realistic as possible estimation relative to conditions since completion of the RA, data are included from immediately prior to the completion of the individual sites RA, only. This conservative measure is intended to lessen the degree the trend line is affected from historical data, as site conditions have changed due to the completion of the RAs. First order rate decay trend analyses for selected monitoring wells have been included in Appendix D. Specifically, trend plots are included in Appendix D1 and an example of the calculations completed is included as Appendix D2.

Where practical, selected compounds and monitoring wells at a particular site are used to predict contaminant reduction timeframes. The target concentration used to estimate the timeframe is the compound-specific RG. To provide an estimate of the time required for the selected explosive compounds and sulfate to naturally degrade to less than site RGs, estimates of future contamination reduction are achieved by including an exponential curve to available concentration versus time data to predict likely contaminant reduction rates (Appendix D1). The exponential curve is used to best represent trends in contaminant concentration where variations in data show no distinct trend. Presented timeframes are very approximate and assume constant contamination reduction rates for a specific compound at a specific point within the aquifer. Groundwater trend analysis results are summarized in Table 3-6. Contaminant reduction represents physical, chemical, and biological attenuation mechanisms active within the aquifer.

The R^2 values displayed on the plots is an indicator of how well the equation resulting from the regression analysis explains the relationship among the variables. An R^2 value equal to 1.0 is an exact fit, and as values approach zero suggest an increasingly poor fit. For this analysis, R^2 values generally range between approximately 0.1 and 0.5. However, there are some R^2 values that are less than 0.1. In these cases, the clean-up time analyses is very unreliable. The primary cause for the low R^2 values is the seasonal variability of the concentrations. Based on the variability of the data the calculated cleanup times are only an estimate based on the data available. For additional information regarding this analysis and an example calculation for estimated clean-up times, refer to the example estimated clean-up time calculation included in Appendix D2.

Recommendations: Recommendations for each site are presented specific to the conditions of the LTM Plan. A thorough summary of recommendations is presented in Section 4.

3.1 SITE L1 (Group 61)

Site L1 (Group 61) is one of six GMZs created to manage risk arising from groundwater contamination and to monitor performance of the selected remedy. Site L1 comprises approximately 80 acres on which munitions production facilities were constructed in 1941. It is centrally located in the northern portion of the LAP (Figures 1-2 and 3-1). Historically, Site L1 was used for demilitarization and reclamation of various munitions starting with crystallization of ammonium nitrate, but then was converted for shell renovation and 1,3,5-trinitrobenzene (TNB) recovery up until 1945. By April of 1946, it had been reactivated to reclaim TNT.

In the TNT operation, steam was used to wash the TNT out of shells. The water was discharged to a sump where solid explosives were removed for burning and the overflow (pink water) was routed to a 4.3-acre ridge and furrow evaporation/percolation pond. By 1952, two additional evaporation ponds had been constructed southeast of the ridge and furrow unit, on either side of a drainage ditch flowing from it to Prairie Creek. Prairie Creek, the surface water body draining the area, is incised into the bedrock and appears to transmit groundwater that discharges directly or emerges into the streambed by virtue of the head relief available in the open channel.

Explosive residues in soil were observed in the ridge and furrow impoundment, the western-most of the two newer ponds, the area south of the washout building, and the soil around the sump. The underlying groundwater contains TNT, TNB, 2,6-DNT, and RDX both in the alluvium and in the shallow weathered bedrock, as well as degradation products from those parent compounds, as a result of the infiltration of pink water and possibly continued leaching of explosives in soil. Soil source control measures at the ridge and furrow pond were completed in March 2006. The contamination is now a legacy groundwater plume continuing to migrate to the southeast towards Prairie Creek, where it is believed to largely discharge into the creek through upwelling. Given these observations, the contaminant footprint is expected to separate from the source area over time and migrate in the alluvium and shallow bedrock until it discharges to Prairie Creek.

The overburden aquifer generally consists of a complex stratification of clay and silt, with some silty gravel observed in the eastern portion of the site near MW174. The overburden is approximately 20 ft thick in the north and less than 5 ft thick in the south, and from approximately 15 ft thick in the east to 5 ft thick in the west.

3.1.1 Groundwater Hydraulics

The groundwater monitoring network at Site L1 consists of 14 monitoring wells: 7 overburden monitoring wells (MW131, MW171, MW173, MW174, MW175, MW176, and MW610) and 7 bedrock monitoring wells (MW172, MW177, MW178, MW401, WES1,

WES2, and WES3). Water levels are measured at the groundwater/surface water locations that are sampled (listed below), and at monitoring wells MW171, MW172, MW175, MW176, MW177, MW178, MW401, MW610, and WES2. Surface water (SW550) elevation is measured at a point along Prairie Creek at the approximate location shown on Figure 3-1. Monitoring well information and water levels from April and October 2018 are summarized in Table 2-3.

Data suggests that Prairie Creek, the surface water body draining the area, transmits groundwater that discharges directly or upwells into the streambed by virtue of the head relief available in the open channel. The groundwater flow direction in the overburden and bedrock aquifers is typically toward the south to the north of Prairie Creek and toward the north to the south of Prairie Creek, as shown on Figures 3-1 and 3-2, respectively. The overburden and bedrock aquifer flow directions are consistent with flow directions observed historically. Based on groundwater flow data, Prairie Creek is the discharge point for shallow groundwater in the vicinity of Site L1.

During April 2018, vertical gradients observed between the overburden and bedrock were downward at monitoring well nests MW172/MW173, MW177/MW171, MW178/MW176, (at distance from the creek) and MW401/MW610 (on the opposite side of the creek from the site (Table 3-7). The water elevations at all overburden and bedrock monitoring wells were greater than the water elevation in Prairie Creek indicating groundwater is discharging to Prairie Creek.

During October 2018, vertical gradients observed between the overburden and bedrock were upward at monitoring well nests MW172/MW173 and MW401/MW610 (on the opposite side of the creek from the site), which further supports a gaining stream scenario, and downward at monitoring well nests MW177/MW171 (at distance from the creek). Monitoring well MW176 was dry in October 2018 (Table 3-7). The water elevations at all overburden and bedrock monitoring wells (with the exception of MW610) were greater than the water elevation in Prairie Creek indicating groundwater is discharging to Prairie Creek.

3.1.2 Analytical Results

Groundwater and surface water sampling locations and parameters collected for Site L1 during October 2018 are summarized in Table 1-1. The following monitoring wells and the surface water sampling location at L1 are sampled for explosives:

- In-Plume – MW131, MW173, and WES1
- Early Warning – MW174 and WES3
- Compliance – surface water sampling point SW550

Early warning monitoring well MW172 and compliance monitoring well MW401 were removed from the LTM program beginning in April 2012.

Groundwater and surface water samples collected at Site L1 in 2018 were analyzed for explosive compounds in accordance with the QAPP. Explosive compound detections for the 2018 sampling events conducted at Site L1 are summarized in Table 3-1 and are shown on Figure 3-3. Historical explosive compound data for Site L1 are summarized in Table B1, included in Appendix B. A brief discussion of analytical results by well type follows.

In-Plume Monitoring Wells (MW131, MW173, and WES1): At overburden monitoring well MW131, 2,6-DNT was not detected in April and exceeded the RG at a concentration of 1.3 micrograms per liter (µg/L) in October; 1,3,5-TNB exceeded the RG at a concentration of 2,900 µg/L in April and 1,400 µg/L in October; TNT exceeded the RG at a concentration of 4,000 µg/L in April and 920 µg/L in October; and 2-amino-4,6-dinitrotoluene (2-A-4,6-DNT) and 4-amino-4,6-dinitrotoluene (4-A-2,6-DNT) were detected in April and October. There are no RGs for 2-A-4,6-DNT or 4-A-2,6-DNT. Due to required dilution, the limits of quantitation (LOQs) were elevated above the RG for 1,3-dinitrobenzene (1,3-DNB, April), 2,4-dinitrotoluene (2,4-DNT, April and October), 2,6-DNT (April), and RDX (April and October).

At overburden monitoring well MW173, HMX was detected below the RG at a concentration of 0.64 µg/L in April and 0.68 µg/L in October; RDX exceeded the RG at a concentration of 6.3 µg/L in April and 4.9 µg/L in October; 1,3,5-TMB was detected below the RG at a concentration of 0.38 µg/L in April and was not detected in October; TNT was detected below the RG at a concentration of 8.2 µg/L in April and 5 µg/L in October; and 2-A-4,6-DNT and 4-A-2,6-DNT were detected in April and October. There are no RGs for 2-A-2,6-DNT or 4-A-2,6-DNT.

At bedrock monitoring well WES1, 2,4-DNT was not detected in April and was detected below the RG at a concentration of 0.25 µg/L in October; 2,6-DNT was not detected in April and was detected below the RG at a concentration of 0.33 µg/L in October; 1,3,5-TNB exceeded the RG at a concentration of 54 µg/L in April and 26 µg/L in October; TNT exceeded the RG at a concentration of 46 µg/L in April and 41 µg/L in October; and 2-A-4,6-DNT and 4-A-2,6-DNT were detected in April and October. There are no RGs for 2-A-2,6-DNT or 4-A-2,6-DNT.

Early Warning Monitoring Wells (MW174 and WES3): At overburden monitoring well MW174, there were no explosive compounds detected in April or October.

At bedrock monitoring well WES3, RDX was detected below the RG at a concentration of 0.35 µg/L in April and 0.4 µg/L in October; TNT was detected below the RG at a concentration of 0.92 µg/L in April and 0.87 µg/L in October; and 2-A-4,6-DNT and 4-A-2,6-DNT were detected in April and October. There are no RGs for 2-A-4,6-DNT or 4-A-2,6-DNT.

Compliance Point (SW550): At surface water sampling location SW550, there were no explosive compounds detected in April or October. According to the LTM Plan, SW550 is to be collected at a point along Prairie Creek where the creek leaves the GMZ boundary.

However, the GMZ boundary is approximately 1,500 ft downstream from where groundwater emanating from the Site L1 source area would likely be discharging to the surface water. Therefore, the sample has been collected at the location shown on Figure 3-1 to provide an indication if the groundwater discharging to Prairie Creek exceeds the surface water RG. If concentrations are detected in excess of the RG at this current sampling location, the sampling location will be moved downstream to the GMZ boundary to determine if surface water is leaving the GMZ in excess of the RG.

3.1.3 Groundwater Trend Evaluation

Information included in the 1998 ROD estimated the timeframe for concentrations to reach the RG at Site L1 to be 340 years, or the year 2338.

Data gathered since the sampling conducted in October 2005, which was the final round conducted prior to completion of the RA, are used for this evaluation to provide a representation of site conditions since the soil source control measures were completed in 2006.

As stated in Section 4.1.1.5 (Monitoring Frequency) of the LTM Plan, "*Historical data suggest concentrations are always higher in the spring.*" and "*Should the first few years of monitoring indicate concentrations are consistently highest at a given season of the year, a change to annual monitoring during that season will be requested*." There does not appear to be consistent seasonal trends for all compounds exceeding the RGs at Site L1.

In-Plume Monitoring Wells (MW131, MW173, and WES1): Groundwater trend graphs included in Appendix D1 were completed for TNT and TNB (Figures D-1 and D-2, respectively) at monitoring well MW131, and were completed for RDX and TNT (Figures D-3 and D-4, respectively) at monitoring well MW173. A trend graph was not completed for monitoring well WES1 due to concentrations at MW131 and MW173 being significantly higher. Therefore, their cleanup times would exceed that of monitoring well WES1. Table 3-6 summarizes the results of this analysis.

At overburden monitoring well MW131, an increasing trend is shown for TNT (Figure D-1) and for TNB (Figure D-2). The estimated time at which TNT will naturally degrade to less than the RG cannot be estimated due to an increasing trend, which is consistent with the *Final 2017 Annual Groundwater Monitoring Report* (2017 Report; IEA/MWH JV, May 2018). The estimated time at which TNB will naturally degrade to less than the RG cannot be estimated due to an increasing trend, representing a change in the estimation included in the 2017 Report of a decreasing trend and the year 2314. However, the R^2 values are extremely low at 0.0073 and 0.0004, respectively, and the identification of increasing concentrations are therefore very unreliable. Based on the variability of the data, primarily due to seasonal fluctuations, the calculated cleanup times are only an estimate utilizing the data available.

At overburden monitoring well MW173, a decreasing trend is shown for RDX (Figure D-3) and an increasing trend is shown for TNT (Figure D-4). The time at which RDX is estimated to naturally degrade to less than the RG is 13 years (the year 2031), which is consistent with the estimation included in the 2017 Report of the year 2031. However, the R^2 value is very low at 0.1433, and the estimated timeframe is therefore unreliable. The estimated time at which TNT will naturally degrade to less than the RG cannot be estimated due to an increasing trend, representing a change in the estimation included in the 2017 Report of a decreasing trend and the year 7108. However, the R^2 value is extremely low at 0.0005, and the identification of and increasing concentration is therefore very unreliable. Based on the variability of the data, primarily due to seasonal fluctuations, the calculated cleanup times are only an estimate utilizing the data available.

According to the LTM Plan, for an in-plume point, *"If the best fit trend line for an exponential relationship for all monitoring data since the completion of soil source control measures has not had a rate constant < 0 for three or more sampling events and concentrations for COCs are above their respective RGs, then additional source control measures may need to be evaluated."* At monitoring well MW131 the TNB and TNT concentrations have been fluctuating. Therefore, additional source control evaluation is not required.

Early Warning Monitoring Wells (MW174 and WES3): At overburden monitoring well MW174, the only explosives detection was for TNT in April 2011. Therefore, there are no trends established.

At bedrock monitoring well WES3, there have been no RG exceedances, only low-level fluctuations. Therefore, there are no trends established.

According to the LTM Plan, for an early warning point, *"if the attenuation rate constant for the best fit exponential trend line of all historic data yields a value of C > RG for three or more sequential sampling events, then there is a risk that the compliance wells will receive concentrations of COC in excess of the RG and either a better estimate of pore water velocity (i.e., a value < 16 ft/yr) is needed or additional corrective measures may need to be evaluated."* Review of the data does not indicate an increasing trend of any detected compounds in WES3, but rather low-level fluctuations below the RG. Therefore, there is no additional corrective measure evaluation required at this time.

Compliance Point (SW550): There have been no detections for explosives at surface water sampling location SW550. Therefore, there are no trends established.

According to the LTM Plan, for a compliance point, *"if Cx > RG, then additional corrective measures may be required."* There have been no detections at the compliance monitoring point. Therefore, there is no additional corrective measure evaluation required at this time.

The completion of soil source control measures in 2006 is expected to minimize contaminant loading to groundwater allowing natural attenuation mechanisms to contain and diminish

groundwater RG exceedances within the GMZ. The remaining groundwater contamination at Site L1 is now a legacy plume traveling to the southeast toward Prairie Creek. The continued presence of explosive breakdown products 2-A-4,6-DNT and 4-A-2,6-DNT (byproducts of the biodegradation of TNT) detected in samples from monitoring wells MW131, MW173, WES1 and WES3 indicates that anaerobic degradation is occurring within the plume. Natural attenuation mechanisms appear to be limiting the areal extent of groundwater contamination within the GMZ boundary. The estimated timeframe for TNB and TNT to reach the RG at monitoring well MW131 cannot be estimated. The estimated timeframe for RDX to reach the RG at monitoring well MW173 is the year 2031, far less than estimated for Site L1 in the 1998 ROD of the year 2338. The estimated timeframe for TNT to reach the RG at monitoring well MW173 cannot be estimated. However, the concentrations are greatly fluctuating and therefore the R value is very low and is only an estimation which is very unreliable.

3.1.4 Recommendations

There are no recommended changes to the LTM program at Site L1.

3.2 SITE L2 (Explosive Burning Grounds)

Site L2 (Explosive Burning Grounds) is the second of six GMZs created to manage risk arising from groundwater contamination and to monitor performance of the selected remedy. At Site L2 the operational area covered approximately 5 acres consisting of six east-west oriented pads that are 650 ft long and 50 ft wide, on which explosives and associated wastes from other production areas were burned. It is located in the central part of the LAP, adjacent to Prairie Creek and Kemery Lake (Figures 1-2 and 3-4). Aerial photographs from 1952 also contain three north-south oriented pads to the east. The latter three pads were subsequently reconfigured into a single pad and the south oil pits were installed at their southern end. Unexploded ordnance (UXO), such as fuses and other items, had been observed on the pads.

Three popping furnaces for burning small arms ammunition were located in the southwest corner of the site (Figure 3-4). Metal residues from site burning were hauled to another location. Soil removal action at the former popping furnaces was completed in 2007. There were also three oil and solvent pits adjacent to the pads, covering less than one-quarter acre each, in which oil was occasionally burned. The pits were remediated in 1996 as part of a removal action. At that time, UXO was encountered to the north of the pads and was also disposed.

The site is drained by Prairie Creek, two drainage ditches flowing from the north to Kemery Lake, and a gulley in the southwest corner that catches runoff from the area of the popping furnaces. While the soil around the popping furnaces was contaminated with arsenic, cadmium, and lead, those metals have not been found in the underlying groundwater and the soil has been remediated. In addition to lead and arsenic, soil around the pads contained

2,6-DNT and RDX, both of which were present in concentrations in excess of their respective RGs, and all of which were remediated in 2007.

Of the soil contaminants, only RDX has been found in the underlying groundwater at concentrations exceeding the RG. HMX has also been observed in groundwater, but the concentrations are below the RG. Surface water samples from Prairie Creek, into which the groundwater discharges, do not contain RDX or HMX at detectable levels.

It is most likely the RDX and HMX from waste disposal activities in the northwestern corner of Site L2 were dissolved by natural precipitation and percolated into site groundwater. From there, they are being transported to Prairie Creek where they will likely emerge if they have not degraded to levels that are not detectable once diluted in the creek. Given the soil source control measures that have taken place, the historical reduction of RDX concentrations in groundwater over the period 1991 to 2006, and the amount of time that has passed since operations ceased, it is likely that the groundwater contamination is detaching from the source area soils in the vicinity of MW404 and will move as a legacy plume.

The overburden aquifer generally consists of clay, sandy/silty clay, sand, and gravel. Gravel layers were predominantly identified near Prairie Creek (i.e. monitoring wells MW133, MW404, and MW405). The overburden thickness is irregular and generally varies between 5 and 25 ft across Site L2.

3.2.1 Groundwater Hydraulics

Site L2 is only sampled during the annual sampling event as recommended in the *Final 2009 Annual Groundwater Monitoring Report* (MHW/Toltest, 2011). Therefore, water levels were not measured and there is no hydraulic information for the semi-annual sampling event conducted in April 2018.

The groundwater monitoring network at Site L2 consists of 8 monitoring wells: 2 overburden monitoring wells (MW135 and MW620), 5 combined overburden/bedrock monitoring wells (MW132, MW133, MW404, MW405, and MW406), and 1 bedrock monitoring well (MW621). Water levels are measured at the groundwater/surface water locations that are sampled (listed below) and at monitoring wells MW133, MW134, MW135, MW405, and MW406. Surface water (SW550) elevation is measured at a point along Prairie Creek. Monitoring well information and water levels for October 2018 are summarized in Table 2-3.

Data indicates that Prairie Creek, the surface water body draining the area, transmits groundwater that discharges directly or upwells into the streambed by virtue of the head relief available in the open channel. Groundwater flow direction in the overburden and bedrock aquifers is generally toward the northwest, as shown on Figures 3-4 and 3-5, respectively. The overburden and bedrock aquifer flow directions are consistent with flow directions observed historically. Based on groundwater flow data, Prairie Creek is the discharge point for shallow groundwater in the vicinity of Site L2.

An upward vertical gradient was observed between the overburden and bedrock at monitoring well nest MW621/MW620 in October 2018 (Table 3-7).

3.2.2 Analytical Results

Site L2 is only sampled during the annual sampling event, as recommended in the *Final 2009 Annual Groundwater Monitoring Report* (MWH/TolTest, 2011). Therefore, there are no analytical results for April 2018. Groundwater and surface water sampling locations and parameters collected for Site L2 during October 2018 are summarized in Table 1-1. The following monitoring wells and surface water sampling location at L2 are sampled for explosives:

- In-Plume – MW404
- Early Warning – MW620
- Compliance – MW621 for the bedrock aquifer, and surface water sampling point SW555 at a point along Prairie Creek where the creek leaves the GMZ boundary for the overburden aquifer.

Compliance monitoring well MW810 was removed from the sampling program beginning in October 2012.

Groundwater and surface water samples collected at Site L2 in 2018 were analyzed for explosive compounds in accordance with the QAPP. Explosive compound detections for the October 2018 sampling event conducted at Site L2 are summarized in Table 3-1 and shown on Figure 3-6. Historical explosives data for Site L2 are summarized in Table B1, included in Appendix B. A brief discussion of analytical results by monitoring well type follows:

In-Plume Monitoring Well (MW404): At combination monitoring well MW404, HMX was detected below the RG at a concentration of 14 µg/L and RDX exceeded the RG at a concentration of 28 µg/L in October.

Early Warning Monitoring Well (MW620): At overburden monitoring well MW620, there were no detections for explosive compounds in October.

Compliance Points (MW621and SW555): At bedrock monitoring well MW621, there were no detections for explosive compounds in October.

At surface water sampling location SW555 in Prairie Creek, there were no detections for explosive compounds in October. According to the LTM Plan, SW555 is to be collected at a point along Prairie Creek where the creek leaves the GMZ boundary. The sample was collected at the location shown on Figure 3-6.

3.2.3 Groundwater Trend Evaluation

Information included in the 1998 ROD estimated the timeframe for concentrations to reach the RG at Site L2 to be 20 years, or the year 2018.

Data gathered since the sampling conducted in October 2006, which was the final round conducted prior to completion of the RA, are used for this evaluation to provide a representation of site conditions since the soil source control measures were completed in 2007. Additionally, since Site L2 is only sampled during the annual sampling event due to historical data indicating that is the event with the highest concentration, only historical results from the annual sampling events are included in the graphing to provide a more accurate representation of the timeframe for concentrations to reach the RG.

As stated in Section 4.1.2.6 (Monitoring Frequency) of the LTM Plan, *"If one season is found to be consistently higher than all others, a recommendation will be made to move to annual monitoring during that season."* and *"If groundwater samples collected from monitoring well MW501 do not exhibit RG exceedances for heavy metals for four consecutive quarters, the recommendation to cease monitoring will be included in the applicable semi-annual or annual groundwater monitoring report."* A change to annual monitoring in the fall only was recommended in the *Final 2010 Semi-annual Groundwater Monitoring Report* (MWH/TolTest, 2011) which was initiated during spring 2012. Monitoring well MW501 was recommended to be removed from the LTM program in the *Final 2010 Semi-annual Groundwater Monitoring Report* (MWH/TolTest, 2011) which was initiated in fall 2011.

In-Plume Monitoring Well (MW404): A groundwater trend graph, included in Appendix D1, was completed for RDX (Figure D-5) at monitoring well MW404 using annual analytical results only. Table 3-6 summarizes the results of this analysis.

At combination monitoring well MW404, a decreasing trend is shown for RDX (Figure D-5). The time at which RDX is estimated to naturally degrade to less than the RG is 30 years (the year 2048), which is consistent with the estimate included in the 2017 Report. However, the R^2 value is very low at 0.3652, and the estimated timeframe is therefore unreliable. However, based on the variability of the data, primarily due to seasonal fluctuations, the calculated cleanup times are only an estimate utilizing the data available.

According to the LTM Plan, for an in-plume point, *"If the best fit trend line for an exponential relationship for all monitoring data since the completion of soil source control measures has not had a rate constant < 0 for three or more sampling events and concentrations for COCs are above their respective RGs, then additional source control measures may need to be evaluated."* The location of MW404 relative to the source area, and a groundwater flow velocity of greater than 50 ft per year (ft/yr), suggest the increasing concentrations from 2009 through 2012 may have been the result of a spike in concentration due to soil disturbance during source control activities completed in 2007.

Early Warning Monitoring Well (MW620): At overburden monitoring well MW620, there have been only low-level detections for several explosive compounds in 2012. Therefore, there are no trends established.

According to the LTM Plan, for an early warning point, *"If the attenuation rate constant for the best fit exponential trend line of all historic data yields a value of C > RG for three or more sequential sampling events, then there is a risk that the compliance wells will receive concentrations of COC in excess of the RG and either a better estimate of pore water velocity (i.e., a value < 2.8 ft/yr) is needed or additional corrective measures may need to be evaluated."* There have been no RG exceedances at MW620, only low level detections of several explosive compounds in October 2012. Therefore, there is no additional corrective measure evaluation required at this time.

Compliance Points (MW621 and SW555): At bedrock monitoring well MW621, there have been only low-level detections for several explosive compounds in October 2011 and 2012. Therefore, there are no trends established.

At surface water sampling location SW555, there has been only one detection for explosive compounds in October 2009. Therefore, there are no trends established.

According to the LTM Plan, for a compliance point, *"if Cx > RG, then additional corrective measures may be required."* There have been no recent explosive compounds detected at compliance monitoring points. Therefore, there is no additional corrective measure evaluation required at this time.

The completion of soil source control measures in 2007 is expected to minimize contaminant loading to groundwater allowing natural attenuation mechanisms to contain and diminish groundwater RG exceedances within the GMZ. The remaining groundwater contamination at Site L2 is now a legacy plume traveling to the northwest toward Prairie Creek. The estimated timeframe for RDX at monitoring well MW404 to reach the RG is the year 2048, 30 years longer than estimated in the 1998 ROD, of the year 2018. However, the R^2 value is very low at 0.3652, and the estimated timeframe is therefore unreliable.

3.2.4 Recommendations

There are no recommended changes to the monitoring program at Site L2.

3.3 SITE L3 (Demolition Area)

Site L3 (Demolition Area) is the third of six GMZs created to manage risk arising from groundwater contamination and to monitor performance of the selected remedy. Site L3 comprises approximately 50 acres used as a demolition area, directly southwest of Site L2 (Figures 1-2 and 3-7). Site L3 is bounded on the west by Prairie Creek, the south by an unnamed tributary of Prairie Creek, and the east by Star Grove Cemetery. Predominant use

of the area was for open burning of combustibles and munitions crates, including some materials with low-level explosive contamination. An air curtain destructor was constructed at the site to reduce emissions, but was never put into use. There was also a 1-acre fire training area at the site, which consisted of a small depression surrounded by an earthen berm.

Specific burning units included "U" and "L" shaped burn pads and a burn cage on a concrete slab. Geophysical surveys noted a number of metallic anomalies buried around the burn pads. The soil was also found to contain lead and RDX contamination at levels requiring remediation. Berms along Prairie Creek were found to contain lead, chlordane, 2,6-DNT, and phosphate exceeding their respective RGs. It has been assumed that the contamination in these berms arises from filling activity in the area when the berms were constructed. Unexploded ordnance may also be present in this area. The remedy selected for the area along Prairie Creek was consolidation and capping into what was called Landfill L3.

Landfill L3 was located on the western edge of the Site L3 GMZ on the east bank of Prairie Creek and occupied 3.32 acres (Figure 3-7). The area of Landfill L3 was originally contaminated through import of contaminated fill. However, other waste and contaminated soil were moved to the Site L3 Landfill as a part of the L3 RA in order to consolidate residual contamination into a smaller footprint. Soil source control measures were completed in 2008. However, removal of Landfill L3 was completed in August 2016.

The overburden aquifer primarily consists of silt and clay with some silty clay and sand. The overburden thickness is irregular and generally varies between approximately 5 ft to greater than 30 ft across Site L3, with limited saturated overburden in the southern part of the site.

3.3.1 Groundwater Hydraulics

The groundwater monitoring network at Site L3 consists of 5 monitoring wells: 1 combined overburden/bedrock monitoring well (MW136) and 4 bedrock monitoring wells (MW412, MW630, MW631, and MW633). Water levels are measured at the groundwater/surface water locations that are sampled (listed below) and at monitoring well MW136. Monitoring well information and water levels for April and October 2018 are summarized in Table 2-3.

Data indicates that Prairie Creek, the surface water body draining the area, transmits groundwater that discharges directly or upwells into the streambed by virtue of the head relief available in the open channel. The surface water elevation in the northern portion of the site is dictated by the dam located on Prairie Creek just north of Central Road (Figure 3-7). The groundwater flow direction in the overburden aquifer is generally toward the west/southwest as shown on Figure 3-7, and the groundwater flow direction in the bedrock aquifer is generally toward the northwest as shown on Figure 3-8. The overburden and bedrock aquifer flow directions are consistent with flow directions observed historically. Based on groundwater flow data, Prairie Creek is the discharge point for shallow groundwater in the vicinity of Site L3.

In April 2018, the groundwater elevation in the bedrock at monitoring well MW632 was greater than the elevation of Prairie Creek indicating a gaining-stream scenario. An upward vertical gradient was observed in the bedrock at monitoring well nest MW631/MW630, further supporting a gaining-stream scenario (Table 3-7).

In October 2018, an upward vertical gradient was observed in the bedrock at monitoring well nest MW631/MW630, further supporting a gaining stream scenario (Table 3-7).

3.3.2 Analytical Results

Groundwater and surface water sampling locations and parameters collected for Site L3 during October 2018 are summarized in Table 1-1. The following monitoring wells and surface water sampling points at L3 are sampled for explosives:

- In-plume – MW412
- Early Warning – MW630, MW631, and MW633
- Compliance – surface water sampling point SW777 for the overburden aquifer where the creek leaves the GMZ boundary

Upgradient monitoring well MW03 and compliance monitoring well MW632 were removed from the LTM program beginning in spring 2012. Surface water sampling points SW004, SW557, and SW558 and TAL metals analysis were removed from the LTM program in April 2017 following one sampling round completed in October 2016 following completion of Landfill L3 removal in August 2016.

Groundwater and surface water samples collected at Site L3 in 2018 were analyzed for explosive compounds in accordance with the QAPP. Explosive compound detections for 2018 sampling events conducted at Site L3 are summarized in Table 3-1 and are shown on Figure 3-9. Historical explosives data for Site L3 are summarized in Table B1, included in Appendix B. A brief discussion of analytical results by monitoring well type follows:

In-Plume Monitoring Well (MW412):
At bedrock well MW412, HMX was detected below the RG at a concentration of 15 µg/L in April and 16 µg/L in October; RDX exceeded the RG at a concentration of 43 µg/L in April and 61 µg/L in October; and 2-A-4,6-DNT and 4-A-2,6-DNT were detected in April and 4-A-2,6-DNT was detected in October. There are no RGs for 2-A-2,6-DNT or 4-A-2,6-DNT.

Early Warning Monitoring Wells (MW630, MW631 and MW633): At bedrock monitoring well MW630, HMX was detected below the RG at a concentration of 1.8 µg/L in April and 1.4 µg/L in October and RDX exceeded the RG at a concentration of 3.3 µg/L in April and was detected below the RG at a concentration of 2.5 µg/L in October.

At bedrock monitoring well MW631, there were no explosive compounds detected in April or October.

At bedrock monitoring well MW633, HMX was detected below the RG at a concentration of 0.47 µg/L in April and 1.4 µg/L in October and RDX was detected below the RG at a concentration of 1.1 µg/L in April and exceeded the RG at a concentration of 3.9 µg/L in October.

Compliance Point (SW777): At surface water sampling location SW777, there were no explosive compounds detected in April or October.

3.3.3 Groundwater Trend Evaluation

Information included in the 1998 ROD estimated the timeframe for concentrations to reach the RG at Site L3 to be 50 years, or the year 2048.

Data since the sampling conducted in May 2008, which was the final round conducted prior to completion of the RA, are used for this evaluation to provide a representation of site conditions since the soil source control measures were completed in 2008.

As stated in Section 4.1.3.5 (Monitoring Frequency) of the LTM Plan, *"Historical data suggest concentrations are always higher in the spring."* and *"Should the first few years of monitoring indicate concentrations are consistently highest at a given season of year, a changeover to annual monitoring during that season will be requested."* Additionally, Section 4.2.1.5 (Monitoring Frequency) of the LTM Plan states, *"Landfill L3 monitoring will be conducted on a semi-annual basis for a period of 30 years or until data support a successful petition to reduce frequency or terminate monitoring based on results showing no statistical difference from background conditions."* Continued semi-annual groundwater monitoring at Site L3 should provide further indication if there are seasonal trends which will allow a reduction to annual monitoring. Landfill L3 has been removed so monitoring frequency relative to the former landfill no longer applies.

In-Plume Monitoring Well (MW412): A groundwater trend graph is included in Appendix D1 which was completed for RDX (Figure D-6) at monitoring well MW412. Table 3-6 summarizes the results of this analysis.

At bedrock monitoring well MW412, a decreasing trend is shown for RDX (Figure D-6). The estimated time at which RDX is estimated to naturally degrade to less than the RG is 14 years (the year 2031), which is consistent with the estimate included in the 2017 Report. The R^2 value is fairly high at 0.7504, and the estimated timeframe is therefore fairly reliable. However, based on the variability of the data, primarily due to seasonal fluctuations, the calculated cleanup times are only an estimate utilizing the data available. Removal of the landfill was completed in August 2016. Concentrations detected do not indicate a specific effect from the removal of the landfill at this time.

According to the LTM Plan, for an in-plume point, *"If the best fit trend line for an exponential relationship for all monitoring data since the completion of source control*

measures has not had a rate constant < 0 for three or more sampling events and concentrations for COCs are above their respective RGs, then additional source control measures need to be evaluated." The RDX concentration at monitoring well MW412 has decreased from a high near the time of completion of landfill capping in 2008. Therefore, there is no additional source control evaluation required at this time.

Early Warning Monitoring Wells (MW630, MW631, and MW633): Groundwater trend graphs included in Appendix D1 were completed for RDX at monitoring wells MW630 (Figure D-7) and MW633 (Figure D-8). Table 3-6 summarizes the results of this analysis.

At bedrock monitoring well MW630, an increasing trend is shown for RDX (Figure D-7). Due to the increasing trend of RDX, cleanup time estimates could not be completed. However, the R^2 value is very low at 0.2365, and the identified trend is therefore unreliable. A spike in concentration was expected after soil remediation activities were conducted in 2008 due to soil disturbance. The location of MW630, relative to the source area, the timeframe in which concentrations began to increase, and a groundwater flow velocity of approximately 140 ft/yr, suggest the RG exceedances from 2010 through 2011 may be the result of a spike in concentration due to soil disturbance during source control activities completed in 2008. A general decreasing trend was observed for RDX from 2012 through 2014 followed by an increasing trend through April 2016, which has been decreasing since. However, based on the variability of the data, primarily due to seasonal fluctuations, the calculated cleanup times are only an estimate utilizing the data available. Removal of the landfill was completed in August 2016. Concentrations detected do not indicate a specific effect from the removal of the landfill at this time.

At bedrock monitoring well MW631, there have been no explosive compound detections. Therefore, no trends have been established.

At bedrock monitoring well MW633, a decreasing trend is shown for RDX (Figure D-8). The time at which RDX is estimated to naturally degrade to less than the RG is 24 years (the year 2042) representing a decrease in the estimated time in the 2017 Report of 2077. However, the R^2 value is very low at 0.106, and the estimated timeframe is therefore unreliable. However, based on the variability of the data, primarily due to seasonal fluctuations, the calculated cleanup times are only an estimate utilizing the data available. Removal of the landfill was completed in August 2016. Concentrations detected do not indicate a specific effect from the removal of the landfill at this time.

According to the LTM Plan, for an early warning point, *"If the attenuation rate constant for the best fit exponential trend line of all historic data yields a value of C > RG for three or more sequential sampling events, then there is a risk that the compliance wells will receive concentrations of COC in excess of the RG and either a better estimate of pore water velocity (i.e., a value < 16 ft/yr) is needed or additional corrective measures may need to be evaluated."* Explosive compounds at monitoring well MW630 indicate an increasing trend. However, the R^2 value is very low at 0.2866, and the estimated timeframe is therefore unreliable. Concentrations have been decreasing since 2016 and there has only been sporadic

low-level compliance point detections. Therefore, there is no additional evaluation required at this time.

Compliance Point (SW777): At surface water sampling location SW777, there has been only low-level explosive compound detections in October 2013 and October 2017. Therefore, no trends have been established.

According to the LTM Plan, for a compliance point, *"if Cx > Background and the best fit trend line for the historic data displays no decrease for >3 years, then additional landfill measures may need to be evaluated.*" There were no RG exceedances at compliance monitoring point and SW777. Therefore, there is no additional corrective measure evaluation required at this time.

3.3.4 Recommendations

There are no recommended changes to the monitoring program at Site L3.

3.4 SITE L14 (Group 4)

Site L14 (Group 4) is the fourth of the six GMZs and comprises 33 acres in the southwestern part of the LAP, where production and storage activities were conducted (Figures 1-2 and 3-10). Initially, fuses were produced at Site L14 by charging them with mercury fulminate at Building 4-14. After 1945, Building 4-14 was modified for the repackaging of smokeless powder. Based on interviews with personnel working in that area, the sump servicing Building 4-5 overflowed periodically, thereby contaminating the surrounding soil. Building 4-5 and the location of the sump are shown on Figure 3-10.

Surface soil sample results from soil samples collected near the large sump north of Building 4-5 contained both 2,4,6-TNT and RDX exceeding their respective RGs at combined levels of up to 55,000 micrograms per kilogram (µg/kg). The presence of RDX in groundwater at Site L14 resulted from percolation of the sump overflows, but additional inputs may also be the product of subsequent leaching of soil residues by natural precipitation. Concentrations declined with depth, but were measured as deep as 5 ft in the soil. A total of approximately 420 cubic yards or 546 tons of contaminated soil were removed during RA activities in 2002 and 2003. Of the two explosive compounds detected in Site L14 soil, only RDX has been observed in groundwater at concentrations in excess of its RG. The primary source is now gone, leaving only a legacy plume in the groundwater migrating to the southwest.

The overburden aquifer primarily consists of silt, clay, and silty clay, with a thin layer of silty gravel at the bedrock contact. Small pockets of sand are present in the higher, unsaturated, parts of the site. The overburden thickness is greater in the south and east (approximately 20 ft) and thins toward the north and west (approximately 10 ft).

3.4.1 Groundwater Hydraulics

Site L14 is only sampled during the annual sampling event as recommended in the *Final 2010 Semi-annual Groundwater Monitoring Report* (MWH/TolTest, 2011). Therefore, water levels were not measured and there is no hydraulic information for the semi-annual sampling event conducted in April 2018.

The groundwater monitoring network at this site consists of 11 monitoring wells: 7 overburden monitoring wells (H7, H8, MW508, MW511, MW512, MW600, and MW601), 2 combined overburden/bedrock monitoring wells (MW140 and MW603, and 2 bedrock monitoring wells MW602 and MW604). Water levels are measured at the groundwater locations that are sampled (listed below), and at monitoring wells H8, MW140, MW508, MW600, MW601, MW602, MW603, and MW604. Monitoring well information and water levels are summarized in Table 2-3. The groundwater flow direction in the overburden aquifer is generally to the southwest as shown on Figure 3-10. The groundwater flow direction in the bedrock aquifer is to the west as shown on Figure 3-11. The overburden and bedrock aquifer flow directions are consistent with flow directions observed historically.

In October 2018, a downward vertical gradient was observed between the overburden and bedrock at monitoring well nest MW602/H7 and an upward vertical gradient was observed between the combination monitoring well and bedrock at monitoring well nest MW604/MW603. Since monitoring well MW603 is a combination monitoring well, the vertical gradient may not indicate the hydraulic relationship between the overburden and bedrock (Table 3-7).

3.4.2 Analytical Results

Site L14 is only sampled in during the annual sampling event as recommended in the *Final 2010 Semi-annual Groundwater Monitoring Report* (MWH/TolTest, 2011). Therefore, there are no analytical results for April 2018. Groundwater sampling locations and parameters collected for Site L14 during October 2018 are summarized in Table 1-1. The following monitoring wells at L14 are sampled for explosives:

- In-Plume –MW511 and MW512
- Early Warning – H7

In-plume monitoring well MW508 and compliance monitoring wells MW603 and MW604 were removed from the sampling program beginning in spring 2012.

Groundwater samples collected at Site L14 in October 2018 were analyzed for explosive compounds in accordance with the QAPP. Explosive compound detections for the October 2018 sampling event conducted at Site L14 are summarized in Table 3-1 and shown on Figure 3-12. Historical explosives compound data for Site L14 are summarized in Table B1, included in Appendix B. A brief discussion of analytical results by monitoring well type follows:

In-Plume Monitoring Wells (MW511 and MW512): At overburden monitoring well MW511, HMX was detected below the RG at a concentration of 8.3 µg/L and RDX exceeded the RG at a concentration of 47 µg/L in October.

At overburden monitoring well MW512, HMX was detected below the RG at a concentration of 31 µg/L; RDX exceeded the RG at a concentration of 76 µg/L; and 2-A-4,6-DNT and 4-A-2,6-DNT were detected in October. There are no RGs for 2-A-4,6-DNT or 4-A-2,6-DNT.

Early Warning Monitoring Well (H7): At overburden monitoring well H7, RDX was detected below the RG at a concentration of 0.47 µg/L.

3.4.3 Groundwater Trend Evaluation

Information included in the 1998 ROD estimated the timeframe for concentrations to reach the RG at Site L14 to be 80 years, or the year 2078.

Data since the sampling conducted in October 2004, which was the final round conducted prior to completion of the RA, are used for this evaluation to provide a representation of site conditions since the soil source control measures were completed in 2005. Additionally, since Site L14 is only sampled during the annual sampling event due to historical data indicating that is the round with the highest concentration, only results from the annual sampling events are included in the graphing to provide a more accurate representation of the timeframe for concentrations to reach the RG.

As stated in Section 4.1.4.5 (Monitoring Frequency) of the LTM Plan, "*Historical data suggest concentrations are always higher in the fall.*" and "*Should the first few years of monitoring indicate concentrations are consistently highest at a given season of year, a changeover to annual monitoring during that season will be requested*." A change to annual monitoring in the fall only was recommended in the *Final 2010 Semi-annual Groundwater Monitoring Report* (MWH/TolTest, 2011) and was initiated during April 2012.

In-Plume Monitoring Wells (MW511 and MW512): Groundwater trend graphs included in Appendix D1 were completed for RDX at monitoring wells MW511 (Figure D-9) and MW512 (Figure D-10) using annual analytical results only. Table 3-6 summarizes the results of this analysis.

At overburden monitoring well MW511, a decreasing trend is shown for RDX (Figure D-9). The time at which RDX is estimated to naturally degrade to less than the RG is 12 years (the year 2030) which is an increase in the estimate included in the 2017 Report, of the year 2026. However, the R^2 value is very low at 0.2684, and the estimated timeframe is therefore unreliable. Based on the variability of the data, the calculated cleanup times are only an estimate utilizing the data available.

At overburden monitoring well MW512, a decreasing trend is shown for RDX (Figure D-10). The time at which RDX is estimated to naturally degrade to less than the RG is 27 years (the year 2045), which is consistent with the estimate included in the 2017 Report of the year 2045. However, the R^2 value is very low at 0.4091, and the estimated timeframe is therefore unreliable. Based on the variability of the data, the calculated cleanup times are only an estimate utilizing the data available.

According to the LTM Plan, for an in-plume point, "*if the best fit trend line for an exponential relationship for all monitoring data since the completion of source control measures has not had a rate constant < 0 for three or more sampling events and concentrations for COCs are above their respective RGs, then additional source control measures need to be evaluated*." Both MW511 and MW512 indicate a decreasing trend in concentration. Therefore there is no additional source control evaluation required at this time.

Early Warning Monitoring Well (H7): At overburden monitoring well H7, there have been no consistent detections. Therefore there are no trends established.

According to the LTM Plan, for an early warning point, *"if the attenuation rate constant for the best fit exponential trend line of all historic data yields a value of C > RG for three or more sequential sampling events, then there is a risk that the compliance wells will receive concentrations of COC in excess of the RG and either a better estimate of pore water velocity (i.e., a value < 10 ft/yr) is needed or additional corrective measures may need to be evaluated."* There have been no consistent detections. Therefore, there is no additional corrective measure evaluation required at this time.

The completion of soil source control measures in 2005 is expected to minimize contaminant loading to groundwater allowing natural attenuation mechanisms to contain and diminish groundwater RG exceedances within the GMZ. The remaining groundwater contamination at Site L14 is now a legacy plume traveling to the southwest. The presence of explosive breakdown products 2-A-4,6-DNT and 4-A-2,6-DNT in samples from monitoring well MW512 indicate that anaerobic degradation is occurring within the plume. These compounds are byproducts of the biodegradation of TNT. Natural attenuation mechanisms appear to be limiting the areal extent of groundwater contamination within the GMZ boundary. Upward vertical gradients (Table 3-7) in the western part of the site also likely limit the vertical migration of contaminants in the shallow bedrock aquifer. The estimated timeframe for RDX at monitoring well MW512 to reach the RG is the year 2045, 33 years less than estimated in the 1998 ROD of the year 2078. However, the R^2 value is very low at 0.4091, and the estimated timeframe is therefore unreliable.

3.4.4 Recommendations

There are no recommended changes to the sampling program at Site L14.

3.5 SITE M1 (Southern Ash Pile)

Site M1 (Southern Ash Pile) is part of the MFG (Figures 1-2 and 3-13), but contains unique contaminants not present at actionable levels in any other GMZ. As such, it is singled out as the fifth of the six GMZs. Site M1 comprises 68 acres in the southwestern part of the MFG where, from 1965 to 1974, ash residues from the incineration of "red water" (TNT production waste water) were landfilled and piled on unlined soil. At various times (1985, 1993, and 1996) after closure, polyvinyl chloride (PVC) liner and clay were used to repair erosion damage to the cover.

Groundwater beneath and downgradient of the pile was observed to contain elevated levels of sulfate, 2,6-DNT, and antimony. The latter two exceeded their respective RGs on a single sample event only, but the sulfate has exceeded its RG continuously in groundwater and occasionally in surface water. In February 2003, the USACE submitted E*xplanation of Significant Differences Site M1 – Southern Ash Pile* (USACE, 2003), which expanded the northern boundary of the GMZ for Site M1 to encompass concentrations of sulfate in excess of the RG that had migrated beyond the original boundary.

The elevated sulfate is believed to originate in leachate from the Site M1 ash pile that infiltrated through the soil and entered the shallow groundwater. Dissolved sulfate then migrated to the northwest. Sulfate-containing groundwater flows into Prairie Creek, which is located northwest of the former ash pile. Concentrations of sulfate have historically been measured as high as 46,000 milligrams per liter (mg/L), which is over 100 times the RG of 400 mg/L. As recently as 2000, surface water samples were collected that exceeded the surface water RG of 500 mg/L. The ash piles were removed in 2006-2007, eliminating the primary source of sulfate. Consequently, dissolved sulfate in groundwater is now a legacy plume migrating to the northwest.

The overburden aquifer primarily consists of silt and clay, with scarce amounts of sand and silty gravel at the bedrock contact. Sand is abundant in the higher, unsaturated parts of the site. Over most of Site M1, the overburden thickness is fairly consistent, ranging between 15 and 20 ft thick. At the northern end of the site, near MW642/MW641, the overburden consists entirely of silty gravel and the depth to bedrock is greater than 40 ft. The presence of Prairie Creek in the western part of M1 suggests that Prairie Creek is the discharge point for shallow groundwater.

3.5.1 Groundwater Hydraulics

The groundwater monitoring network within at Site M1 consists of 14 monitoring wells: 6 overburden monitoring wells (MW104, MW231, MW351, MW641, MW643, and MW645), 3 combined overburden/bedrock monitoring wells (MW105, MW107, and MW649), and 5 bedrock monitoring wells (MW201, MW640, MW642, MW644, and MW646). Water levels are measured at the groundwater/surface water locations that are sampled (listed below), and at monitoring wells MW104, MW105, MW106, MW201,

MW347, MW351, and MW647. Monitoring well information and water levels for April and October 2018 are summarized in Table 2-2.

Data suggests that Prairie Creek, the surface water body draining the area, transmits groundwater that discharges directly or upwells into the streambed by virtue of the head relief available in the open channel. The groundwater flow direction in the overburden aquifer and bedrock aquifers is generally to the west-northwest, as shown on Figures 3-13 and 3-14, respectively. The overburden and bedrock aquifer flow directions are consistent with flow directions observed historically. Based on groundwater flow data, Prairie Creek is the discharge point for shallow groundwater in the vicinity of Site M1.

In April and October 2018, between the overburden and bedrock, vertical gradients observed were upward at monitoring well nests MW644/MW643 (next to and south of Prairie Creek), MW646/MW645 (next to and north of Prairie Creek) indicating a gaining-stream scenario, and MW640/MW351 located upgradient from the pond indicating groundwater is discharging to the pond. The vertical gradient observed was downward at monitoring well nest MW642/MW641 located downgradient from the pond indicating the pond is discharging to groundwater (Table 3-7).

3.5.2 Analytical Results

Groundwater sampling locations and parameters collected for Site M1 during April and October 2018 are summarized in Table 1-1. The following monitoring wells and the surface water sampling point at M1 are sampled for sulfate:

- In-Plume – MW107, MW231, MW640, MW641, and MW642
- Early Warning – MW643 and MW644
- Compliance – MW646 for the bedrock aquifer, and MW645, and MW649 and surface water sampling point SW709 where the creek leaves the GMZ boundary for the overburden aquifer.

Groundwater and surface water samples collected at Site M1 in 2018 were analyzed for sulfate in accordance with the QAPP. Sulfate detections for 2018 sampling events conducted at Site M1 are summarized in Table 3-3 and are shown on Figure 3-15. Historical sulfate data for Site M1 are summarized in Table B3, included in Appendix B. A brief discussion of analytical results by monitoring well type follows:

In-Plume Monitoring Wells (MW107, MW231, MW640, MW641, and MW642): At combination monitoring well MW107, sulfate exceeded the RG at a concentration of 2,700 mg/L in April and 9,800 mg/L in October.

At overburden monitoring well MW231, sulfate exceeded the RG at a concentration of 32,000 mg/L in April and 33,000 mg/L in October.

At bedrock monitoring well MW640, sulfate exceeded the RG at a concentration of 3,900 mg/L in April and 3,800 mg/L in October.

At overburden monitoring well MW641, sulfate was detected below the RG at a concentration of 250 mg/L in April and exceeded the RG at a concentration of 470 mg/L in October.

At overburden monitoring well MW642, sulfate was detected below the RG at a concentration of 280 mg/L in April and 290 mg/L in October.

Early Warning Monitoring Wells (MW643 and MW644): At overburden monitoring well MW643, sulfate was detected below the RG at a concentration of 78 mg/L in April and 38 mg/L in October.

At bedrock monitoring well MW644, sulfate was detected below the RG at a concentration of 130 mg/L in April and 140 mg/L in October.

Compliance Points (MW645, MW646, MW648, MW649, and SW709): At overburden monitoring well MW645, sulfate was detected below the RG at a concentration of 60 mg/L in April and 78 mg/L in October.

At bedrock monitoring well MW646, sulfate was detected below the RG at a concentration of 100 mg/L in April and 110 mg/L in October.

At overburden monitoring well MW649, sulfate was detected below the RG at a concentration of 47 mg/L in April and 110 mg/L in October.

At surface water sampling point SW709, sulfate was detected below the surface water RG at a concentration of 55 mg/L in April and 65 mg/L in October.

3.5.3 Groundwater Trend Evaluation

Data since the sampling conducted in April 2008, which was the final round conducted prior to completion of the RA, are used for this evaluation to provide a representation of site conditions since the soil source control measures were completed in 2008.

As stated in Section 4.1.5.5 (Monitoring Frequency) of the LTM Plan, *"If one season is found to be consistently higher than all others, a recommendation will be made to move to annual monitoring during that season."* Results do not indicate concentrations are consistently higher during a given season. Continued monitoring will provide additional data regarding seasonal variations.

In-Plume Monitoring Wells (MW107, MW231, MW640, MW641, and MW642): Groundwater trend graphs included in Appendix D1 were completed for sulfate at monitoring wells MW107 (Figure D-11), MW231 (Figure D-12), MW640 (Figure D-13),

MW641 (Figure D-14), and MW642 (Figure D-15). Table 3-6 summarizes the results of this analysis.

At combination monitoring well MW107, a decreasing trend is shown for sulfate (Figure D-11). The time at which sulfate is estimated to naturally degrade to less than the RG is 17 years (the year 2035), which is consistent with the estimate included in the 2017 Report of the year 2035. However, the R^2 value is low at 0.6114, and the estimated timeframe is therefore somewhat reliable. The sulfate concentration at monitoring well MW107 has been declining since spring 2009 sampling, which may indicate the effect from the source control measures completed in 2008. Since dilution and dispersion are the primary attenuation mechanisms for sulfate at M1, the concentrations are expected to continue to decrease with time. Based on the variability of the data, primarily due to seasonal fluctuations, the calculated cleanup times are only an estimate utilizing the data available.

At overburden monitoring well MW231, a decreasing trend is shown for sulfate (Figure D-12). The time at which sulfate is estimated to naturally degrade to less than the RG is 415 years (the year 2433), which is consistent with the estimate included in the 2017 Report of the year 2433. However, the R^2 value is very low at 0.2086, and the estimated timeframe is therefore unreliable. Recent concentrations of sulfate have been relatively constant. Since dilution and dispersion are the primary attenuation mechanisms for sulfate at M1, the concentrations are expected to decrease as time from the soil source control measures completed in 2008 increases. Based on the variability of the data, primarily due to seasonal fluctuations, the calculated cleanup times are only an estimate utilizing the data available.

At bedrock monitoring well MW640, a decreasing trend is shown for sulfate (Figure D-13). The estimated time at which sulfate will naturally degrade to less than the RG is 150 years (the year 2168), which is consistent with the estimate included in the 2017 Report of the year 2168. However, the R^2 value is extremely low at 0.055, and the estimated timeframe is therefore very unreliable. Since dilution and dispersion are the primary attenuation mechanisms for sulfate at M1, the distance from the source area and the groundwater velocity of approximately 7 to 9 ft/yr would suggest that the results of the source control measures completed in 2008 have not had an effect at monitoring well MW640. The concentrations are expected to decrease as time from the soil source control measures completed in 2008 increases. Based on the variability of the data, primarily due to seasonal fluctuations, the calculated cleanup times are only an estimate utilizing the data available.

At overburden monitoring well MW641, a decreasing trend is shown for sulfate (Figure D-14). The estimated time at which sulfate will naturally degrade to less than the RG is 3 years (the year 2021), which is a decrease in the estimate included in the 2017 Report of the year 2026. However, the R^2 value is low at 0.5922 and the estimated timeframe is therefore somewhat reliable. The concentration dropped below the RG in October 2016, April 2017, and April 2018. Based on the variability of the data, primarily due to seasonal fluctuations, the calculated cleanup times are only an estimate utilizing the data available.

However, based on the recent results, the variation in concentrations should remain below the RG in the near future, as estimated.

At overburden monitoring well MW642, a decreasing trend is shown for sulfate (Figure D-15). The time at which sulfate is estimated to naturally degrade to less than the RG was the year 2014. However, the R^2 value is low at 0.6743 and the estimated timeframe is therefore somewhat reliable. Concentrations have been below the RG since December 2014.

According to the LTM Plan, for an in-plume point, *"if the best fit trend line for an exponential relationship for all monitoring data since the completion of source control measures has not had a rate constant < 0 for three or more sampling events and concentrations for COCs are above their respective RGs, then additional source control measures need to be evaluated."* In-plume monitoring wells indicate decreasing concentrations and recent concentrations have been relatively stable, are lower than they have been historically, and are expected to continue to decline as time from source control measures increases. Based on the location of monitoring wells MW640, MW641, and MW642 (Figure 3-15), the observed concentrations are likely the effect of migration of releases prior to source control measure implementation. Based on the slow attenuation of sulfate due to dilution and dispersion being the primary attenuation mechanisms for sulfate at Site M1, the downgradient extent of groundwater exceeding the RG is expected to continue to decrease in the near future. Based on the probability that these observed concentrations are the result of a legacy plume, no additional source control evaluation is recommended at this time.

Early Warning Monitoring Wells (MW643 and MW644): At overburden monitoring well MW643, there were no RG exceedances and concentrations have remained steady.

At bedrock monitoring well MW644, there were no RG exceedances and concentrations have remained steady.

Unlike explosives for which biological degradation plays an important role, attenuation of sulfate is a function of distance from the source as the plume is diluted with recharge and other inputs of uncontaminated water. As such, it is possible to prepare target concentrations for each early warning well that can be used to determine if monitoring results indicate a pending problem. Section 4.1.5.6 and Table 4-6 of the LTM Plan provide maximum allowable target concentrations for sulfate at each early warning monitoring well based on a determined attenuation rate that can be used to determine if results indicate a potential future exceedance at compliance monitoring wells MW645/MW646. Although monitoring wells MW640, MW641, and MW642 were re-designated as in-plume monitoring wells, these same target concentrations are evaluated for those monitoring wells. The following table summarizes the monitoring well number, April and October analytical results in mg/L, and target concentration in mg/L.

Well Number	April Result (mg/L)	October Result (mg/L)	Target Concentration (mg/L)
MW640	3,900	3,800	6,439
MW641	250	470	1,754
MW642	280	290	1,728
MW643	78	38	438
MW644	130	140	427

This analysis shows that the concentrations from the sample collected in April and October do not exceed the LTM Plan target concentration. Therefore, this suggests, based on the determined attenuation rate at Site M1 that sulfate concentrations detected at in-plume monitoring wells MW640, MW641, and MW642 and early warning monitoring wells MW643 and MW644 are not expected to exceed the RG at the compliance points in the future. Historical sulfate concentrations are summarized on Table B3 in Appendix B.

According to the LTM Plan, *"In order to interpret monitoring results after each sampling event, the new data will be compared directly with the trigger concentrations provided in Table 4-6. If Cx> trigger, for more than two sequential events, then some other means of providing protection may be necessary, depending on where in the pathway the problem arises and what the current uses of water are at the compliance point."* Results are below the target concentration at all locations. Therefore, there are no other means of protection required at this time.

Compliance Points (MW645, MW646, MW648, MW649, and SW709): At overburden monitoring well MW645, concentrations have been recently remaining steady. The RG exceedance detected in December 2014 was the first exceedance detected at monitoring well MW645, and the detected concentrations have been below the RG since. Therefore, the December 2014 exceedance is considered to be anomalous. Thus there is no trend established.

At bedrock monitoring well MW646, concentrations have recently remained steady. The RG exceedance detected in December 2014 was the first exceedance detected at monitoring well MW646, and the detected concentrations have been below the RG since. Therefore, the December 2014 exceedance is considered to be anomalous. Thus there is no trend established.

At overburden monitoring well MW648, there have been no RG exceedances and concentrations have remained steady. Therefore, there was no trend established.

At overburden monitoring well MW649, concentrations have remained steady. The RG exceedance detected in December 2014 was the first exceedance detected at monitoring well MW649, and the detected concentrations have been below the RG since. Therefore, the December 2014 exceedance is considered to be anomalous. Therefore there is no trend established.

At surface water sampling location SW709, there have been no RG exceedances and concentrations have been remaining steady. Therefore there is no trend established.

According to the LTM Plan, for a compliance point, *"if Cx > RG, then additional corrective measures may be required."* Concentrations detected are fluctuating at low levels. The exceedances detected in December 2014 are considered anomalous based on no previous or subsequent exceedances. Therefore, there is no additional corrective measure evaluation required at this time.

The completion of soil source control measures in 2008 is expected to minimize contaminant loading to groundwater, allowing natural attenuation mechanisms to contain and diminish groundwater RG exceedances within the GMZ. The remaining groundwater contamination at Site M1 is now a legacy plume traveling to the west-northwest toward Prairie Creek. While sulfate can be reduced to sulfides biologically under anaerobic conditions, the process requires organic substrate to sustain the anaerobic conditions. Moreover, nitrates are reduced before sulfates. There is no evidence that sulfate reduction is occurring to any extent at Site M1. Therefore, dispersion and dilution are the primary attenuation mechanisms for sulfate at M1. Concentrations are expected to continue to decrease with time. However, the migration of the legacy plume will continue to be observed to determine if dispersion and dilution are sufficient in decreasing concentrations prior to discharging to Prairie Creek.

3.5.4 Recommendations

There are no recommended changes to the sampling program at Site M1.

The graph for the trend analysis for monitoring well MW642 will be removed from future annual reports since the sulfate concentration has maintained below the RG since December 2014.

3.6 MFG GMZ

The MFG is the sixth GMZ, situated in the northwestern part of JOAAP, and created by the consolidation of several discrete sites, including M3 (Flashing Grounds), M4 (Lead Azide Area), M5 (Tetryl Production Area), M6 (TNT Ditch Complex), M7 (Red Water Area), M8 (Acid Manufacturing Area), Other Areas, and M13 (Gravel Pit). The MFG GMZ is shown on Figures 1-2 and 3-16. In the MFG GMZ, only Sites M6, M8, and M13 continue to have groundwater contamination with contaminants of concern (COCs) in excess of RGs. Each site comprising the MFG GMZ will be independently closed before the MFG GMZ can be eliminated. Groundwater closure reports were completed in 2015 for Sites M3 (*Final Site M3 Groundwater Closure Report*, MWH, May 2015), M5 (*Final Site M5 Groundwater Closure Report*, MWH, May 2015), and M7 (*Final Site M7 Groundwater Closure Report*, MWH, May 2015).

Numerous monitoring wells are measured as water level control points within the MFG GMZ at sites M3, M4, M5, M6, M7, M8, and Other Areas (Section 3.6.1) and M13 (Section 3.6.2).

3.6.1 Site M6 (TNT Ditch Complex)

Site M6 (TNT Ditch Complex) covers approximately 271 acres in the central part of the MFG (Figures 1-2 and 3-16). It was largely used for TNT and DNT production during World War II, and then again in the Korean and Vietnam Wars. In between the wars, the facilities were used for research and development of different explosives like nitroxylenes. Production of TNT was terminated in 1977.

Production of TNT was conducted in 12 parallel lines, each containing a full sequence of production steps from the "mono-house" to the "bi-house" and then the "tri-house" buildings. Waste water ("red water") from each "tri-house" and the wash houses was discharged from wooden tanks to clay-lined ditches feeding into the TNT Ditch. In 1965, the original drainage system was replaced by wooden flumes completed in the TNT Ditch, and the red water was diverted to Site M7 for treatment. Dintrotoluene production waste water was discharged from wooden tanks into open troughs and ditches that flowed to the storm water sewer system and the TNT Ditch, ultimately flowing untreated into Grant Creek. In addition to normal processing water, the TNT Ditch received drench water used to kill a production run, when reactions ran out of control and posed an explosive threat. Between 1972 and 1974, there were more than 30 recorded instances of drenching with the associated discharge of "bi-oil" and concentrated nitric and sulfuric acids.

The full range of nitroaromatic compounds have historically been found in soil at Site M6, with concentrations of TNT, 2,4-DNT, lead, arsenic, and beryllium exceeding their respective RGs. Seven explosive compounds have been historically observed in the underlying groundwater at concentrations that exceed their respective RGs: TNT, 2,4-DNT, 2,6-DNT, 2-NT, TNB, NB, and RDX.

The overburden aquifer primarily consists of silt and clay, with variable amounts of sand and silty gravel. The overburden thickness ranges from 5 to 30 ft across the site. Based on available information, screens for overburden monitoring wells at Site M6 are set in silt and/or clay layers and discontinuous sand and gravel layers; with the exceptions of monitoring wells MW650 and MW652, which have screens set in a silty gravel layer.

The USDA has been completing natural restoration work in the MNTP property located on the western part of the MFG area, west of the railroad tracks. Part of the work that has been completed is removal of man-made surface water drainage features. The result over time has been a gradual increase in the number and size of surface water features in that area. During heavy rain events there has been more overland flow observed as opposed to channelized discharge.

3.6.1.1 Groundwater Hydraulics

The groundwater monitoring network within Site M6 consists of 36 monitoring wells: 11 overburden monitoring wells (MW160, MW165, MW166R, MW210R, MW212R, MW307, MW309, MW650, MW652, MW662, and MW664), 2 combined overburden/bedrock monitoring wells (MW125R and MW162R), and 23 bedrock monitoring wells (MW122, MW123R, MW209, MW213R, MW215R, MW308, MW310R, MW311, MW312, MW313, MW314, MW315, MW316, MW317, MW318, MW319, MW320R, MW651, MW653, MW654, MW655, MW663, and MW665).

Water levels are measured at the groundwater locations that are sampled (listed below), and at numerous monitoring wells at M6 and surrounding sites, including M3, M4, M5, M7, M8, and Other Areas.

The groundwater monitoring network within Site M3 consists of 1 bedrock monitoring well (MW113). The *Final Site M3 Groundwater Closure Report* (MWH, May 2015) recommended all monitoring wells at Site M3, with the exception of monitoring well MW113, be abandoned. Monitoring well MW113 will be maintained as it provides a control point for the bedrock groundwater potentiometric surface in the southwestern part of the MFG GMZ.

The groundwater monitoring network within Site M4 consists of 2 monitoring wells: 1 combined overburden/bedrock monitoring well (MW157) and 1 bedrock monitoring well (MW158).

The groundwater monitoring network within Site M5 consists of 2 monitoring wells: 1 overburden monitoring well (MW207R) and 1 bedrock monitoring well (MW356R). The *Final Site M5 Groundwater Closure Report* (MWH, May 2015) recommended all monitoring wells at Site M5, with the exception of monitoring wells MW207R and MW356R, be abandoned. Monitoring well MW207R will be maintained as it provides a groundwater control point for the overburden water table in the southeastern part of the MFG GMZ, and monitoring well MW356R will be maintained as it provides a groundwater control point for the bedrock potentiometric surface in the south-central part of the MFG GMZ.

The groundwater monitoring network at Site M7 consists of 6 monitoring wells: 4 overburden monitoring wells (MW156, MW216, MW660, and MW661) and 2 bedrock monitoring wells (MW124R, and MW217). The *Final Site M7 Groundwater Closure Report* (MWH, May 2015) recommended all monitoring wells at Site M7, with the exception of monitoring well MW159, be maintained as they provide horizontal groundwater control points and/or vertical flow information.

The groundwater monitoring network within Site M8 consists of 6 monitoring wells: 5 overburden monitoring wells (MW121, MW147R, MW323R, MW325R, and MW330) and 1 combined overburden/bedrock monitoring wells (MW148RR).

The groundwater monitoring network within Other Areas consists of 4 monitoring wells: 2 combined overburden/bedrock monitoring wells (MW117 and MW119) and 2 bedrock monitoring well (MW116 and MW118).

Monitoring well information and water levels are summarized in Table 2-2. The groundwater flow direction in the overburden and bedrock aquifers is generally toward the west as shown on Figures 3-16 and 3-17. The overburden and bedrock aquifer flow directions are consistent with flow directions observed historically.

For Site M6 monitoring well nests located on the escarpment, in April and October 2018 vertical gradients observed between the overburden and bedrock at monitoring well nests MW650/MW651, MW652/MW653, MW212R/MW215R, MW210R/MW213R, MW309/MW310R and MW307/MW308 were downward and at monitoring well nest MW166R/MW320R was upward. Vertical gradients in the bedrock at monitoring well nests MW311/MW312 and MW314/MW315 were upward in April and downward in October.

In April and October 2018, for monitoring well nests located in the wetland on the west side of Site M6, vertical gradients observed in the bedrock at monitoring well nests MW318/MW319 and MW654/MW313 were upward, downward in April and upward in October at monitoring well nest MW316/MW317.

In April and October 2018, at combination monitoring well and bedrock monitoring well nest MW162R/MW123R, the vertical gradient was downward. Since monitoring well MW162R is a combination monitoring well, the vertical gradient may not indicate the hydraulic relationship between the overburden and bedrock.

In April and October 2018, Site M4 (located west of the southern part of Site M6) at combination and bedrock monitoring well nest MW157/MW158, the vertical gradient was downward. Since monitoring well MW157 is a combination monitoring well the vertical gradient may not indicate the hydraulic relationship between the overburden and bedrock.

During April and October 2018, Site M7 (located to the southwest of the southern part of site M6) at overburden monitoring well nest MW660/MW661, the vertical gradient was downward in April and there was no vertical gradient in October 2018 and at overburden to bedrock monitoring well nest MW216/MW217 the vertical gradient was upward in April and October 2018.

Vertical gradients are summarized in Table 3-7.

3.6.1.2 Analytical Results

Groundwater sampling locations and parameters collected for Site M6 and other sites included in the MFG GMZ during April and October 2018 are summarized in Table 1-1. The following monitoring wells at M6 and other sites included in the MFG GMZ are sampled for explosives (only sulfate at Site M8):

- In-Plume – MW212R, MW652, and MW330 (M8, sulfate only)

- Early Warning – MW123R, MW162R, MW313, MW318, MW319, and MW654
- Compliance – MW117 and MW118 and MW119 (Other Areas).

In-plume monitoring well MW148RR and compliance monitoring wells MW112, MW113, MW115, and MW116 were removed from the LTM program beginning in spring 2012. Early warning monitoring well MW124R was removed from the LTM program beginning in August 2015.

Groundwater samples collected at Site M6 and other sites included in the MFG GMZ in 2018 were analyzed for explosive compounds, and monitoring well MW330 was analyzed for sulfate, in accordance with the QAPP. Explosive compound detections for 2018 sampling events conducted at Site M6 are summarized in Table 3-1 and are shown on Figure 3-18. Sulfate detections for 2018 sampling events conducted at Site M8 are summarized in Table 3-3 and are shown on Figure 3-18. Historical explosives data for Site M6 and sulfate data for Site M8 are summarized in Tables B1 and B3, respectively, included in Appendix B. A brief discussion of analytical results by monitoring well type follows:

In-Plume Monitoring Wells (MW212R, MW652, and MW330): At overburden monitoring well MW212R, 2,4-DNT exceeded the RG at a concentration of 11 µg/L in April and 1,200 µg/L in October; 2,6-DNT exceeded the RG at a concentration of 5.9 µg/L in April and 250 µg/L in October; 2-NT was detected below the RG at a concentration of 54 µg/L in April and 4,000 µg/L in October; and TNT was detected below the RG at a concentration of 1.8 µg/L in April and exceeded the RG at a concentration of 130 µg/L in October. In addition, 2-A-4,6-DNT, 4-A-2,6-DNT, 3-NT, and 4-NT were detected in April and 2-A-4,6-DNT, 3-NT, and 4-NT were detected in October. There are no RGs for 2-A-4,6-DNT, 4-A-2,6-DNT, 3-NT, or 4-NT. Due to required dilution, the LOQs were elevated above the RG for 1,3-DNB, RDX, and 1,3-TNB in October.

At overburden monitoring well MW652, 2,4-DNT exceeded the RG at a concentration of 1,300 µg/L in April and 1,100 µg/L in October; 2,6-DNT exceeded the RG at a concentration of 320 µg/L in April and 350 µg/L in October; 2-NT exceeded the RG at a concentration of 5,600 µg/L in April and was detected below the RG at a concentration of 4,700 µg/L in October; and TNT exceeded the RG at a concentration of 170 µg/L in April and 150 µg/L in October. In addition, 2-A-4,6-DNT, 3-NT, and 4-NT were detected in April. There are no RGs for 2-A-4,6-DNT, 3-NT, or 4-NT. Due to required dilution, the LOQs for 1,3-DNB, RDX, and 1,3,5-TNB were elevated above their respective RGs in April and October.

At overburden monitoring well MW330, sulfate exceeded the RG at a concentration of 440 mg/L in April and 460 mg/L in October.

Early Warning Monitoring Wells (MW123R, MW162R, MW313, MW318, MW319, and MW654): At bedrock monitoring well MW123R, 2,6-DNT was not detected in April and exceeded the RG at a concentration of 0.47 µg/L in October.

At overburden monitoring well MW162R, there were no explosive compounds detected in April or October.

At bedrock monitoring well MW313, there were no explosive compounds detected in April or October.

At bedrock monitoring well MW318, NB was detected below the RG at a concentration of 3.4 µg/L in April and was not detected in October; 2-NT was not detected in April and was detected below the RG at a concentration of 0.41 µg/L in October; and 3-NT was detected in April and was not detected in October. There is no RG for 3-NT.

At bedrock monitoring well MW319, NB was detected below the RG at a concentration of 2.4 µg/L in April and was not detected in October and 3-NT was detected in April and was not detected in October. There is no RG for 3-NT.

At bedrock monitoring well MW654, 2,4-DNT exceeded the RG at a concentration of 1.6 µg/L in April and 9.1 µg/L in October; 2,6-DNT exceeded the RG at a concentration of 1.5 µg/L in April and 9.1 µg/L in October; 2-NT was not detected in April and was detected below the RG at a concentration of 7.9 µg/L in October; Tetryl was not detected in April and was detected below the RG at a concentration of 0.51 µg/L in October; and 2,4,6-TNT was detected below the RG at a concentration of 3.4 µg/L in April and was not detected in October. In addition, 2-A-4,6-DNT and 4-A-2,6-DNT were detected in April and October and 3-NT and 4-NT were detected in October. There are no RGs for 2-A-4,6-DNT, 4-A-2,6-DNT, 3-NT, or 4-NT.

Compliance Monitoring Wells (MW117 and, MW118 and MW119 (Other Areas): At combination monitoring well MW117, there were no explosive compounds detected in April or October.

At bedrock monitoring well MW118, there were no explosive compounds detected in April or October.

At bedrock monitoring well MW119, there were no explosive compounds detected in April or October.

3.6.1.3 Groundwater Trend Evaluation

Information included in the 1998 ROD estimated the timeframe for concentrations to reach the RG at the MFG to be 50 years, or the year 2048.

Data since the sampling conducted in October 2004 for Site M6, which was the final round conducted prior to completion of the RA, are used for this evaluation to provide a representation of site conditions since the soil source control measures were completed in 2005. At Site M8, the specific date for completion of the RA is unknown. Therefore data since October 2003 are used for this evaluation.

As stated in Section 4.1.7.5 (Monitoring Frequency) of the LTM Plan, *"If one season is found to be consistently higher than all other, a recommendation will be made to move to annual monitoring during that season."* Results do not indicate concentrations are consistently higher during a given season.

In-Plume Monitoring Wells (MW212R, MW652, and MW330): Groundwater trend graphs included in Appendix D1 were completed for 2,4-DNT, 2,6-DNT, 2-NT, and TNT (Figures D-16 through D-19, respectively) at monitoring well MW212R; for 2,4-DNT, 2,6-DNT, 2-NT, and TNT (Figures D-20 through D-23, respectively) at monitoring well MW652; and for sulfate (Figure D-24) at monitoring well MW330. Table 3-6 summarizes the results of this analysis.

At overburden monitoring well MW212R, decreasing trends are shown for 2,4-DNT (Figure D-16), 2,6-DNT (Figure D-17), 2-NT (Figure D-18), and TNT (Figure D-19). The time at which 2,4-DNT is estimated to naturally degrade to less than the RG is 84 years (the year 2102), representing a decrease in the estimated time in the 2017 Report of the year 2150. However, the R^2 value is extremely low at 0.0415, and the identified trend is therefore very unreliable. The time at which 2,6-DNT is estimated to naturally degrade to less than the RG is 69 years (the year 2087), representing a decrease in the estimated time in the 2017 Report of the year 2129. However, the R^2 value is extremely low at 0.0591, and the identified trend is therefore very unreliable. The time at which 2-NT is estimated to naturally degrade to less than the RG is 2 years (the year 2020), which is consistent with the estimate included in the 2017 Report of the year 2020. However, the R^2 value is extremely low at 0.0479, and the identified trend is therefore very unreliable. The time at which TNT is estimated to naturally degrade to less than the RG is 29 years (the year 2047), representing a decrease in the estimate included in the 2017 Report of the year 2158. However, the R^2 value is extremely low at 0.0772, and the identified trend is therefore very unreliable. Based on the variability of the data, primarily due to seasonal fluctuations, the calculated cleanup times are only an estimate utilizing the data available.

At overburden monitoring well MW652, decreasing trends are shown for 2,4-DNT (Figure D-20), 2,6-DNT (Figure D-21), 2-NT (Figure D-22), and TNT (Figure D-23). The time at which 2,4-DNT is estimated to naturally degrade to less than the RG is 79 years (the year 2097), which represents a decrease in the estimation in the 2017 Report of the year 2143. However, the R^2 value is very low at 0.3363, and the estimated timeframe is therefore unreliable. The time at which 2,6-DNT is estimated to naturally degrade to less than the RG is 52 years (the year 2070), which represents a decrease in the estimation in the 2017 Report of the year 2091. However, the R^2 value is very low at 0.4072, and the estimated timeframe is therefore unreliable. The time at which 2-NT is estimated to naturally degrade to less than the RG is 7 years (the year 2025), representing a decrease in the estimate included in the 2017 Report of the year 2032. However, the R^2 value is very low at 0.4382, and the estimated timeframe is therefore unreliable. The time at which TNT is estimated to naturally degrade to less than the RG is 27 years (the year 2045), which is consistent with the estimation in the 2017 Report of the year 2045. However, the R^2 value is low at 0.5096, and the estimated timeframe is therefore somewhat reliable. Based on the variability of the data, primarily due

to seasonal fluctuations, the calculated cleanup times are only an estimate utilizing the data available.

At overburden monitoring well MW330, an increasing trend continues to be shown for sulfate (Figure D-24). Although an overall increasing trend is indicated, the sulfate concentration has been generally declining since August 2015 and the concentration detected in October 2018 (460 mg/L) only slightly exceeds the RG of 400 mg/L. Due to the increasing trend of sulfate, cleanup time estimates could not be completed. However, the R^2 value is extremely low at 0.0031, and the estimated timeframe is therefore very unreliable.

According to the LTM Plan, for an in-plume point, *"If the best fit trend line for an exponential relationship for all monitoring data since the completion of source control measures has not had a rate constant < 0 for three or more sampling events and concentrations for COCs are above their respective RGs, then additional source control measures need to be evaluated."* Monitoring wells MW212R and MW652 indicate consistently decreasing trends in concentrations. Therefore there is no additional source control evaluation required at this time.

At monitoring well MW330, concentrations increased through October 2013, stabilized through August 2015, and have declined through October 2018. Therefore there is no additional source control evaluation required at this time.

Early Warning Monitoring Wells (MW123R, MW162R, MW313, MW318, MW319, and MW654): At bedrock monitoring well MW123R, there have been no detections of explosive compounds since November 2010 until the exceedance of 2,6-DNT in October 2018. Therefore, there are no trends established.

At overburden monitoring well MW162R, there have been no detections of explosive compounds since August 2015. Therefore, there are no trends established.

At bedrock monitoring well MW313, there have been no explosive compounds detected since April 2017, and there have historically only been sporadic low-level detections of explosive compounds prior to that. Therefore, there are no trends established.

At bedrock monitoring well MW318, a decreasing trend is shown for 2,6-DNT (Figure D-25). The time at which 2,6-DNT is estimated to naturally degrade to less than the RG is 6 years (the year 2023), which is consistent with the estimation in the 2017 Report of the year 2023. However, the R^2 value is low at 0.3917, and the estimated timeframe is therefore unreliable. Based on the variability of the data, primarily due to seasonal fluctuations, the calculated cleanup times are only an estimate utilizing the data available. In actuality, 2,6-DNT has not been detected since October 2013.

At bedrock monitoring well MW319, detections of explosive compounds have been low-level fluctuations of various compounds. Therefore, there are no trends established.

At bedrock monitoring well MW654, increasing trends are shown for 2,4-DNT (Figure D-26), 2,6-DNT (Figure D-27), and TNT (Figure D-28). Due to the increasing trends, cleanup time estimates could not be completed. However, the R^2 values are low at 0.2287 (2,4-DNT), 0.2869 (2,6-DNT), and 0.4051 (2,4,6-TNT), and the estimated timeframes are therefore unreliable. However, based on the variability of the data, primarily due to seasonal fluctuations, the calculated cleanup times are only an estimate utilizing the data available. Detections of explosive compounds prior to August 2015 had been low-level fluctuations with sporadic exceedances for 2,4-DNT and 2,6-DNT.

Early warning monitoring well MW654 (bedrock) is located west of the escarpment, in the general downgradient direction from Source Area monitoring well MW652 (overburden well), located on the escarpment. There is a downward vertical gradient at monitoring well nest MW652/MW653. Historical detections at MW652 for 2,4-DNT, 2,6-DNT, and 2,4,6-TNT have been decreasing indicating a combination of attenuation, dispersion, and dilution are likely occurring. The constituents recently detected at MW654 are similar to those historically detected in MW652 (with the exception of 2-NT) and were similarly detected at concentrations exceeding the RG in August 2015 (2,4-DNT and 2,6-DNT) and April 2017 (2,4,6-TNT).

According to the LTM Plan, for an early warning point, *"If the attenuation rate constant for the best fit exponential trend line of all historic data yields a value of C > RG for three or more sequential sampling events, then there is a risk that the compliance wells will receive concentrations of COC in excess of the RG and either a better estimate of pore water velocity (i.e., a value < 10 ft/yr) is needed or additional corrective measures may need to be evaluated."* At monitoring well MW318, detections of 2,6-DNT have remained below the RG since October 2014, and historic exceedances are believed to be the result of a low-level legacy plume (slug) moving through the aquifer, which is expected to attenuate as it moves further downgradient.

At monitoring well MW654, there have been RG exceedances for 2,4-DNT and 2,6-DNT since August 2015, and RG exceedances for 2,4,6-TNT since April 2016. Historical exceedances and detections (prior to 2015) have been low-level and inconsistent in nature, whereas the recent exceedances (since 2015) have been more significant. These may be the result of plume migration from the vicinity of upgradient Source Area monitoring well MW652. However, detections for each constituent in October 2016 indicated a significant reduction in concentration which generally continue to decline. Future sampling will provide additional data and allow identification of an ongoing trend indicating plume migration, or sporadic exceedances indicating a legacy plume (slug) moving through the aquifer from the vicinity of Source Area monitoring well MW652. Additionally, the increase in the surface water being retained in the western part of the MFG (and resulting increase in groundwater recharge) may result in an increase in dilution and dispersion of any constituents migrating to the west from the area of MW654.

Compliance Monitoring Wells (MW117 and MW118 and MW119 (Other Areas)): At combination monitoring well MW117, there have been no recent detections of explosive compounds. Therefore, there are no trends established.

At bedrock monitoring well MW118, there have been no recent consistent detections of explosive compounds. Therefore, there are no trends established.

At bedrock monitoring well MW119, there have been no recent consistent detections of explosive compounds. Therefore, there are no trends established.

According to the LTM Plan, for a compliance point, *"if Cx > RG, then additional corrective measures may be required."* Detections have been minimal and sporadic low-level fluctuations. Therefore, there is no additional corrective measure evaluation required at this time.

The completion of soil source control measures in 2005 is expected to minimize contaminant loading to groundwater, allowing natural attenuation mechanisms to contain and diminish groundwater RG exceedances within the GMZ. The remaining groundwater contamination at Site M6 is now a legacy plume traveling to the west. The presence of explosive breakdown products 2-A-4,6-DNT and 4-A-2,6-DNT, detected in samples from monitoring wells MW212R, MW652, and MW654, indicate that anaerobic degradation is occurring within the plume. These compounds are byproducts of the biodegradation of TNT. Natural attenuation mechanisms are limiting the areal extent of groundwater contamination within the GMZ boundary.

3.6.1.4 Recommendations

There are no recommended changes to the LTM program at the Site M6 or Site M8.

The graph for the trend analysis for monitoring well MW318 will be removed from future annual reports since the 2,6-DNT concentration has maintained below the RG since October 2013.

3.6.2 Landfill M13 (Gravel Pit)

Site M13 (Gravel Pit) comprises approximately 106 acres of the central part of the MFG known as the gravel pits. It lies north of the Tetryl Production Area, east of the TNT Ditch Complex, and west of the Acid Area (Figures 1-2, 3-16, and 3-19).

Landfill M13 is located in the northern part of Site M13 and comprises approximately 10.5 acres. Site features at Landfill M13 and surrounding areas are illustrated on Figures 3-16 and 3-19. Disposal activities were confined to four discrete areas of the site, none of which extended beyond 12 acres in size. Historical records indicate landfilling took place in the Northern Gravel Pit during the period of 1966 to 1984, and involved scrap metals, creosote-treated railroad ties, telephone poles, and construction/demolition debris. Other

waste management activities at Site M13 involved explosives. Explosive compounds observed in the groundwater at Site M13 include: TNT, TNB, 2,4-DNT, and 2,6-DNT.

Soil in the vicinity of the Northern Gravel Pit had been found to contain beryllium, lead, and benzo(a)pyrene as COCs. On a single occasion in 1991, antimony and cadmium were reported to be present in groundwater samples at concentrations in excess of their respective RGs, but they have not exceeded the RGs since.

The current conceptual site model is that metal and benzo(a)pyrene in groundwater may be present as a result of leaching of waste materials in the Northern Gravel Pit. The explosives present in groundwater are far more likely to be present due to infiltration of wastewater in the TNT Ditch. There is no evidence to suggest explosive compounds were ever present in waste materials put into the pit.

The Northern Gravel Pit was consolidated and capped (Landfill M13) during 2007 and 2008. The three other pits received waste materials that do not appear to pose a threat to human health and the environment.

With the implementation of the RA on the TNT Ditch and the capping of the Northern Gravel Pit, it is anticipated that contaminants in site groundwater will detach from the source areas and migrate as legacy plumes to the west. As such, concentrations are expected to decline with time.

Monitoring at Landfill M13 is mandated by IAC Title 35, Subtitle G, Chapter 1, Subchapter c, Part 724, Subpart G for a period of 15 years.

The overburden aquifer primarily consists of silt and clay, with abundant sand and gravel in the upper, unsaturated portion of the aquifer. The overburden thickness is approximately 25 ft and is fairly consistent across Site M13. Samples from overburden monitoring wells are obtained from silt and/or clay layers.

3.6.2.1 Groundwater Hydraulics

The groundwater monitoring network at Landfill M13 consists of 12 monitoring wells: 6 overburden monitoring wells (AEHA14R, MW126R, MW363, MW806, MW809, and MW811), 1 combined overburden/bedrock monitoring well (MW362), and 5 bedrock monitoring wells (MW321, MW322, MW364, MW807, and MW809). Water levels are measured at the groundwater locations that are sampled (listed below), and at monitoring wells AEHA14R, MW321, MW322, MW350, MW363, and MW364. Monitoring well information and water levels for April and October 2018 are summarized in Table 2-2. The groundwater flow direction in the overburden aquifer in the immediate vicinity of Landfill M13 is to the south/southeast as shown on Figures 3-16 and 3-19. The groundwater flow direction in the bedrock aquifer in the immediate vicinity of Landfill M13 was generally toward the south as shown on Figure 3-17 and 3-20. The overburden and bedrock aquifer flow directions are consistent with flow directions observed historically.

In April and October 2018, the vertical gradient observed in the overburden to combination was upward at downgradient monitoring well nest MW126R/MW362. Since monitoring well MW362 is a combination monitoring well, the vertical gradient may not indicate the hydraulic relationship within the overburden and bedrock. Between the overburden and bedrock, downward vertical gradients were observed at upgradient monitoring well nest MW806/MW807 and downgradient monitoring well nests MW808/MW809 and MW363/MW364. In the bedrock, a downward vertical gradient was observed at distal downgradient monitoring well nest MW321/MW322 (Table 3-7).

3.6.2.2 Analytical Results

Groundwater sampling locations and parameters collected for Landfill M13 within the MFG GMZ for the 2018 sampling event are summarized in Table 1-1. The following monitoring wells at Landfill M13 are sampled for VOCs, SVOCs, TAL metals, explosives, nitrate, and sulfate:

- Upgradient – MW806 and MW807
- Downgradient – MW126R, MW362, MW808, MW809, and MW811

Groundwater samples collected at Landfill M13 during April and October 2018 were analyzed for explosive compounds, TAL metals, indicator parameters (sulfate and nitrate), VOCs, and SVOCs, in accordance with the QAPP. Detections of explosive compounds, TAL metals, indicator parameters (sulfate and nitrate), VOCs, and SVOCs for the sampling events conducted at Landfill M13 during April and October 2018 are summarized in Tables 3-1 through 3-5, respectively. Explosive compound and sulfate detections are shown on Figures 3-18 and 3-21. Historical analytical data for Landfill M13 are summarized in Tables B1 though B5, included in Appendix B. For Landfill M13 the monitoring well locations are classified as upgradient or downgradient locations. A brief discussion of analytical results by monitoring well type follows:

Upgradient Monitoring Wells (MW806 and MW807): At overburden monitoring well MW806, there were no explosive compounds detected and no RG exceedances for TAL metals in April or October; nitrate was detected below the RG at a concentration of 0.29 mg/L in April and was not detected in October; sulfate was detected below the RG at a concentration of 69 mg/L in April and 52 mg/L in October; and there were no VOCs or SVOCs detected in April or October.

At bedrock monitoring well MW807, there were no explosive compounds detected and no RG exceedances for TAL metals in April or October; nitrate was not detected in April or October; sulfate was detected below the RG at a concentration of 200 mg/L in April and 250 mg/L in October; 1,1-dichloroethane (1,1-DCA) was detected below the RG at a concentration of 1.4 µg/L in April and 1.4 µg/L in October; cis-1,2-dichloroethene (cis-1,2-DCE) was detected below the RG at a concentration of 1.2 µg/L in April and 1.1 µg/L in October; and there were no SVOCs detected in April or October.

Downgradient Monitoring Wells (MW126R, MW362, MW808, MW809, and MW811): At overburden monitoring well MW126R, there were no explosive compounds detected in April or October; no RG exceedances for TAL metals; nitrate was detected below the RG at a concentration of 1.4 mg/L in April and 0.02 mg/L in October; sulfate was detected below the RG at a concentration of 210 mg/L in April and 99 mg/L in October; and there were no VOCs or SVOCs detected in April or October.

At bedrock monitoring well MW362, 2,4-DNT exceeded the RG at a concentration of 4 µg/L in April and 6.7 µg/L in October; 2,6-DNT exceeded the RG at a concentration of 0.45 µg/L in April and 0.52 µg/L in October; 2-A-4,6-DNT and 4-A-2,6-DNT were detected in April and October; there were no RG exceedances for TAL metals in April or October; nitrate was detected below the RG at a concentration of 0.1 mg/L in April and was not detected in October; sulfate was detected below the RG at a concentration of 250 mg/L in April and 270 mg/L in October; 1,1-DCA was detected below the RG at a concentration of 0.64 µg/L in April and 0.7 µg/L in October; and in the SVOC sample, 2,4-DNT exceeded the RG at a concentration of 2.6 µg/L in April and 3.2 µg/L in October. There are no RGs for 2-A-2,6-DNT and 4-A-2,6-DNT.

At overburden monitoring well MW808, there were no explosive compounds detected in April or October; no RG exceedances for TAL metals in April or October; nitrate was detected below the RG at a concentration of 16 mg/L in April and 0.53 mg/L in October; sulfate was detected below the RG at a concentration of 140 mg/L in April and 220 mg/L in October; and there were no VOCs or SVOCs detected in April or October.

At bedrock monitoring well MW809, the were no explosive compounds detected in April or October; no RG exceedances for TAL metals in April or October; nitrate was detected below the RG at a concentration of 0.067 mg/L in April and 0.2 mg/L in October; sulfate was detected below the RG at a concentration of 6.8 mg/L in April and 9.5 mg/L in October; and there were no VOCs or SVOCs detected in April or October.

At overburden monitoring well MW811, the were no explosive compounds detected in April or October; no RG exceedances for TAL metals in April or October; nitrate was detected below the RG at a concentration of 0.013 mg/L in April and 0.038 mg/L in October; sulfate was detected below the RG at a concentration of 130 mg/L in April and 190 mg/L in October; and there were no VOCs or SVOCs detected in April or October.

3.6.2.3 Groundwater Trend Evaluation

Data since the sampling conducted in May 2008, which was the final round conducted prior to completion of the RA, are used for this evaluation to provide a representation of site conditions since the soil source control measures were completed in 2008.

As stated in Section 4.2.3.5 (Monitoring Frequency) of the LTM Plan, *"Monitoring is required on a quarterly basis for five years, followed by ten years of semi-annual sample collection."* Quarterly sampling through 2014 represented completion of five (plus) years of quarterly sampling and a reduction to semi-annually in 2015.

Upgradient Monitoring Wells (MW806 and MW807): At overburden monitoring well MW806, there have been no recent detections of explosive compounds, no RG exceedances of TAL metals, no RG exceedances of nitrate, no RG exceedances of sulfate, no recent detections of VOCs, and no recent detections of SVOCs. Therefore, there are no trends established.

At bedrock monitoring well MW807, there have been no detections of explosive compounds, no RG exceedances of TAL metals, no RG exceedances of nitrate, no RG exceedances of sulfate, no RG exceedances of VOCs, and no recent detections of SVOCs. Therefore, there are no trends established.

Downgradient Monitoring Wells (MW126R, MW362, MW808, MW809 and MW811): A groundwater trend graph included in Appendix D1 was completed for 2,4-DNT at monitoring well MW362 (Figure D-29). Table 3-6 summarizes the results of this analysis.

At overburden monitoring well MW126R, there have been no recent detections of explosive compounds, no RG exceedances of TAL metals, no RG exceedances of nitrate, no RG exceedances of sulfate, no RG exceedances of VOCs, and no detections of SVOCs. Therefore, there are no trends established.

At combination monitoring well MW362, an increasing trend is shown for 2,4-DNT (Figure D-29). Due to the increasing trend of 2,4-DNT, cleanup time estimates could not be completed. However, the R^2 value is low at 0.3086, and the identified trend is therefore unreliable. Decreasing concentrations should eventually be observed for 2,4-DNT as time from the source control measures completed in 2008 increases. But based on the variability of the data, primarily due to seasonal fluctuations, the calculated cleanup times are only an estimate utilizing the data available. Additionally, there have been no RG exceedances for TAL metals, no RG exceedances for nitrate, no RG exceedances for sulfate, and no RG exceedances for VOCs. Therefore, there are no trends established. There have been SVOC exceedances for 2,4-DNT. However, the 2,4-DNT result from the explosives analysis is used for the trend analysis of this compound.

At overburden monitoring well MW808, there have been no detections of explosive compounds, no recent RG exceedances of TAL metals, no RG exceedances of nitrate, no RG exceedances of sulfate, no RG exceedances of VOCs, and no detections of SVOCs. Therefore, there are no trends established.

At overburden monitoring well MW809, there have been no recent detections of explosive compounds, no RG exceedances of TAL metals, no RG exceedances of nitrate, no RG exceedances of sulfate, no RG exceedances of VOCs, and no detections of SVOCs. Therefore, there are no trends established.

At overburden monitoring well MW811, there have been no detections of explosive compounds, no RG exceedances of TAL metals, no RG exceedances of nitrate, no RG

exceedances of sulfate, no RG exceedances of VOCs, and no detections of SVOCs. Therefore, there are no trends established.

For the in-plume sample point, the decision rule is: *If Cx > upgradient and the best fit trend line for the historic data displays no decrease for >3 years, then additional landfill measures may need to be evaluated.* Figure D-29 indicates concentrations have been fluctuating but relatively stable since October 2013. Samples collected from monitoring well MW811 do not indicate the presence of 2,4-DNT. Based on the location of monitoring well MW811 and the direction of groundwater flow, the 2,4-DNT detected at monitoring well MW362 is not believed to be emanating from Landfill M13.

With respect to the landfill in-plume monitoring wells, the operative decision rules are the same for the early warning and compliance sampling points for the landfill monitoring area in which they reside. The 2,4-DNT RG exceedance at downgradient monitoring well MW362 has not been determined to be either an in-plume, early warning, or compliance point. Therefore, there is no decision rule to apply to this location with exceedances.

The completion of soil source control measures in 2008 is expected to minimize contaminant loading to groundwater allowing natural attenuation mechanisms to contain and diminish groundwater RG exceedances within the GMZ by preventing precipitation from percolating through waste in the future. The continued presence of explosive breakdown products 2-A-4,6-DNT and 4-A-2,6-DNT detected in samples from monitoring well MW362 indicates that anaerobic degradation is occurring within the plume. These compounds are byproducts of the biodegradation of TNT. Natural attenuation mechanisms are to be limiting the areal extent of groundwater contamination within the GMZ boundary.

3.6.2.4 Recommendations

There are no recommended changes to the LTM program at Site M13.

The landfill cap and surrounding area should be mowed in spring and fall 2019.

The rip rap should be sprayed with 2,4-Dichlorophenoxyacetic acid (2,4-D) to prevent growth of woody plants in the rip rap that could compromise the integrity of the rip rap around the mounded landfill, without killing grasses, in spring 2019.

Woody plants observed on the landfill cap, rip rap, and surrounding area should be spot treated using a strong herbicide (Razor™).

Further evaluation into the source for the 2,4-DNT and 2,6-DNT exceeding the RG at monitoring well M13-MW362 will be conducted in the 2020 to 2021 timeframe.

3.7 LANDFILL M11 (Landfill)

Landfill M11 (Landfill) is not included in a GMZ. Landfill M11 is located in the southwestern part of the manufacturing side of JOAAP, as illustrated on Figures 1-2 and 3-22. The landfill monitoring area comprises approximately 133 acres. Site M11 was divided into two sections by School House Road, and bordered on the west by West Patrol Road. M11 north encompassed approximately 10.5 acres of former gravel pits that were mined and filled with waste. M11 south, a former gravel pit, encompassed approximately 5.6 acres that was also mined and filled with waste. The remedy chosen for M11 was waste consolidation and capping. Implementation of the remedy was completed in 2008.

The current conceptual site model is that M11 is believed to include manganese- and sulfate-containing waste that could potentially contaminate underlying groundwater and migrate.

With the implementation of the RA at Site M11, it is anticipated that the landfill cap will prevent percolation of precipitation through waste consolidated in the landfill, thus preventing groundwater contamination.

Monitoring at Landfill M11 is mandated by IAC Title 5, Subtitle G, Chapter 1, Subchapter c, Part 724, Subpart G for a period of 30 years. Long-term monitoring of the landfill cap will include quarterly inspections of the cap, vegetation, and drainage structures for the first 5 years, then annually for 25 years.

3.7.1 Groundwater Hydraulics

Site M11 is only sampled in during the annual sampling event as recommended in the *Final 2011 Annual Groundwater Monitoring Report* (MWH/TolTest, 2013). Therefore, water levels were not measured and there is no hydraulic information for the semi-annual sampling event conducted in April 2018.

The groundwater monitoring well network at Landfill M11 consists of 8 monitoring wells: 1 combination overburden/bedrock monitoring well (MW802) and 7 bedrock monitoring wells (MW333, MW334, MW335, MW336, MW803, MW804, and MW805). Water levels are measured at the groundwater locations that are sampled (listed below). Monitoring well information and water levels for October 2018 are summarized in Table 2-2. Bedrock is shallow at Landfill M11, ranging from 2.5 to 9 ft below ground surface. Therefore, based on the monitoring wells present, the groundwater flow maps have been revised from a water table and potentiometric to a shallow and deep potentiometric map. The groundwater flow direction in the shallow bedrock aquifer is generally toward the west as shown on Figure 3-22. The groundwater flow direction in the deep bedrock aquifer is generally toward the northwest as shown on Figure 3-23. The shallow and deep bedrock aquifer flow directions are consistent with flow directions observed historically.

The calculated vertical gradient between the combination monitoring well and bedrock at upgradient monitoring well nest MW803/MW802 and within the bedrock at downgradient monitoring well nest MW805/MW804 was upward in October 2018. Since monitoring well MW802 is a combination monitoring well, the vertical gradient may not indicate the hydraulic relationship between the overburden and bedrock (Table 3-7).

3.7.2 Analytical Results

Site M11 is only sampled during annual sampling event as recommended in the *Final 2011 Annual Groundwater Monitoring Report* (MWH/TolTest, 2013). Therefore, there are no analytical results for the semi-annual sampling event conducted in April 2018. Groundwater sampling locations and parameters collected for Landfill M11 during 2018 are summarized in Table 1-1. The following monitoring wells at Landfill M11 are sampled for VOCs, SVOCs, TAL metals, explosives, nitrate, and sulfate:

- Upgradient – MW802 and MW803
- Downgradient – MW333, MW334, MW335, MW336, MW804, and MW805

Groundwater samples collected at Landfill M11 in 2018 and were analyzed for explosive compounds, TAL metals, indicator parameters (sulfate and nitrate), VOCs, and SVOCs, in accordance with the QAPP. Detections of explosive compounds, TAL metals, indicator parameters (sulfate and nitrate), VOCs, and SVOCs for the sampling event conducted at Site M11 in 2018 are summarized in Tables 3-1 through 3-5, respectively. Sulfate detections are shown on Figure 3-24. Historical analytical data for Landfill M11 are summarized in Tables B1 through B5, included in Appendix B. Site M11 monitoring well locations are classified as upgradient or downgradient locations. A brief discussion of analytical results by monitoring well type follows:

Upgradient Monitoring Wells (MW802 and MW803): At combination monitoring well MW802, there were no detections of explosive compounds, no RG exceedances of TAL metals; nitrate was not detected; sulfate was detected below the RG at a concentration of 130 mg/L; and there were no detections of VOCs or SVOCs in October.

At bedrock monitoring well MW803, there were no detections of explosive compounds; no RG exceedances of TAL metals; nitrate was detected below the RG at a concentration of 0.77 mg/L; sulfate was detected below the RG at a concentration of 81 mg/L; and there were no detections of VOCs or SVOCs in October.

Downgradient Monitoring Wells (MW333, MW334, MW335, MW336, MW804, and MW805): At bedrock monitoring well MW333, there were no detections of explosive compounds; no RG exceedances of TAL metals; nitrate was detected below the RG at a concentration of 0.34 mg/L; sulfate was detected below the RG at a concentration of 65 mg/L; and there were no detections of VOCs or SVOCs in October.

At bedrock monitoring well MW334, there were no detections of explosive compounds; no RG exceedances of TAL metals; nitrate was not detected; sulfate was detected below the RG at a concentration of 160 mg/L; and there were no detections of VOCs or SVOCs in October.

At bedrock monitoring well MW335, there were no detections of explosive compounds; no RG exceedances of TAL metals; nitrate was not detected; sulfate was detected below the RG at a concentration of 340 mg/L; and there were no detections of VOCs or SVOCs in October.

At bedrock monitoring well MW336, there were no detections of explosive compounds; no RG exceedances of TAL metals; nitrate was not detected; sulfate was detected below the RG at a concentration of 350 mg/L; and there were no detections of VOCs or SVOCs in October.

At combination monitoring well MW804, there were no detections of explosive compounds; no RG exceedances of TAL metals; nitrate was not detected; sulfate was detected below the RG at a concentration of 300 mg/L; and there were no detections of VOCs or SVOCs in October.

At bedrock monitoring well MW805, HMX was detected below the RG at a concentration of 0.58 µg/L; no RG exceedances of TAL metals; nitrate was not detected; sulfate was detected below the RG at a concentration of 350 mg/L; and there were no detections of VOCs or SVOCs in October.

3.7.3 Groundwater Trend Evaluation

Data since the sampling conducted in May 2008, which was the final round conducted prior to completion of the RA (except MW805, which was not sampled in May 2008), are used for this evaluation to provide a representation of site conditions since the soil source control measures were completed in 2008. Therefore, Site M11 is only sampled in the annual sampling event due to historical data indicating that is the round with the highest concentration. Only results from the fall sampling events (other than the initial point in May 2008 for MW335 and MW336) are included to provide a more accurate representation of the timeframe for concentrations to reach the RG.

As stated in Section 4.2.2.5 (Monitoring Frequency) of the LTM Plan, *"Sampling of monitoring wells at Landfill M11 is required on a semi-annual basis for a period of 30 years. If monitoring results prove to be stable and highly predictable, the installation may request a change to annual monitoring."* Concentrations at Landfill M11 appear to be stable and predictable, and sulfate is consistently declining. Therefore, Site M11 was removed from the semi-annual sampling event beginning in 2012.

Upgradient Monitoring Wells (MW802 and MW803): At combination monitoring well MW802, there have been no recent detections of explosive compounds, no RG exceedances of TAL metals, no RG exceedances of nitrate, no RG exceedances of sulfate, no detections of VOCs, and no detections of SVOCs. Therefore, there are no trends established.

At bedrock monitoring well MW803, there have been no detections of explosive compounds, no RG exceedances of TAL metals, no RG exceedances of nitrate, no RG exceedance of sulfate, no RG exceedances of VOCs, and no detections of SVOCs. Therefore, there are no trends established.

Downgradient Monitoring Wells (MW333, MW334, MW335, MW336, MW804, and MW805): Groundwater trend graphs included in Appendix D1 were completed for sulfate at monitoring wells MW335 (Figure D-30), MW336 (Figure D-31), and MW805 (Figure D-32). Table 3-6 summarizes the results of this analysis.

At bedrock monitoring well MW333, there have been no detections of explosive compounds, no RG exceedances of TAL metals, no RG exceedances of nitrate, no RG exceedances of sulfate, no detections of VOCs, and no detections of SVOCs. Therefore, there are no trends established.

At bedrock monitoring well MW334, there have been no detections of explosive compounds, no RG exceedances of TAL metals, no RG exceedances of nitrate, no recent RG exceedances of sulfate, no RG exceedances of VOCs, and no detections of SVOCs. Therefore, there are no trends established.

At bedrock monitoring well MW335, a decreasing trend is shown for sulfate on Figure D-30. The time at which sulfate is estimated to naturally degrade to less than the RG is 1 year (the year 2019), which is consistent with the estimate included in the 2017 Report of the year 2019. However, the R^2 value is low at 0.3466, and the estimated timeframe is therefore unreliable. Based on the variability of the data, primarily due to seasonal fluctuations, the calculated cleanup times are only an estimate utilizing the data available. Since dilution via groundwater recharge and dispersion are the primary attenuation mechanisms for sulfate at Site M11, the concentrations are expected to decrease as time from the soil source control measures completed in 2008 increases. There have been no detections of explosive compounds, no RG exceedances of TAL metals, no RG exceedances of nitrate, no RG exceedances of VOCs, and no detections of SVOCs. Therefore, there are no trends established for those parameters.

At bedrock monitoring well MW336, a decreasing trend is shown for sulfate on Figure D-31. Although the sulfate concentration has been below the RG since December 2014 (with the exception of the October 2017 result) the time at which sulfate is estimated to naturally degrade to less than the RG is 21 years (the year 2039) which is less than with the estimate included in the 2017 Report of the year 2052. However, the R^2 value is very low at 0.128, and the estimated timeframe is therefore unreliable. Based on the variability of the data, primarily due to seasonal fluctuations, the calculated cleanup times are only an estimate utilizing the data available. Since dilution via groundwater recharge and dispersion are the primary attenuation mechanisms for sulfate at Site M11, the concentrations are expected to decrease as time from the soil source control measures completed in 2008 increases. There have been no detections of explosive compounds, no RG exceedances of TAL metals, no RG

exceedances of nitrate, no RG exceedances of VOCs, and no detections of SVOCs. Therefore, there are no trends established for those parameters.

At bedrock monitoring well MW804, there have been no exceedances of explosive compounds, no RG exceedances of TAL metals, no RG exceedances of nitrate, sporadic RG exceedance of sulfate, no detections of VOCs, and no detections of SVOCs. Therefore, there are no trends established.

At bedrock monitoring well MW805, a decreasing trend is shown for sulfate on Figure D-32. The time at which sulfate is estimated to naturally degrade to less than the RG is 1 year (the year 2019) representing a decrease in the estimated time in the 2017 Report of 2021. However, the R^2 value is fairly high at 0.7522, and the estimated timeframe is therefore fairly reliable. Based on the variability of the data, primarily due to seasonal fluctuations, the calculated cleanup times are only an estimate utilizing the data available. There have been no recent detections of explosive compounds, no RG exceedances of TAL metals, no RG exceedances of nitrate, no RG exceedances of VOCs, and no detections of SVOCs. Therefore, there are no trends established.

For the in-plume sampling point, the decision rule is: *If Cx > upgradient and the best fit trend line for the historic data displays no decrease for >3 years, then additional landfill measures may need to be evaluated*. Decreasing trends are occurring at the monitoring wells with sulfate RG exceedances. Therefore, additional landfill measures do not need to be evaluated at this time.

With respect to the landfill in-plume monitoring wells, the operative decision rules are the same for the early warning and compliance sample points for the landfill monitoring area in which they reside. The monitoring wells with sulfate RG exceedances at downgradient monitoring locations have not been determined to be either in-plume, early warning, or compliance points. Therefore, there is no decision rule to apply to those locations with exceedances.

The completion of soil source control measures in 2008 is expected to minimize contaminant loading to groundwater, allowing natural attenuation mechanisms to contain and diminish groundwater RG exceedances. While sulfate can be reduced to sulfides biologically under anaerobic conditions, the process requires organic substrate to sustain the anaerobic conditions. Moreover, nitrates are reduced before sulfates. There is no evidence that sulfate reduction is occurring to any extent at Site M11. Therefore, dispersion and dilution are the primary attenuation mechanisms for sulfate at M11. Concentrations are expected to continue to decrease with time.

3.7.4 Recommendations

There are no recommended changes to the sampling program at M11.

The landfill cap and surrounding area should be mowed in spring and fall 2019.

The rip rap should be sprayed with 2,4-D to prevent growth of woody plants in the rip rap that could compromise the integrity of the rip rap around the mounded landfill, without killing grasses, in spring 2019.

Woody plants observed on the landfill cap, rip rap, and surrounding area should be spot treated using a strong herbicide (Razor™).

4.0 SUMMARY OF RECOMMENDATIONS

The following section present a summary of recommendations made in this Report that are relevant to the LTM program. A summary of the recommendations to the LTM program, the reasoning for the recommendation, and the status of those recommendations are included in Table 4-1.

The following is a summary of recommendations:

- The LTM program, as outlined in Table 3-8, should be implemented for the 2019 semi-annual sampling event.
- Landfills M11 and M13: landfill caps and surrounding areas should be mowed in spring and fall 2019.
- Landfills M11 and M13: rip rap should be sprayed with 2,4-D to prevent growth of woody plants in the rip rap that could compromise the integrity of the rip rap around the mounded landfill, without killing grasses, in spring 2019.
- Landfills M11 and M13: woody plants observed on the caps, rip rap, and surrounding area should be spot treated using a strong herbicide (Razor™).
- The graph for the trend analysis for Site M1 monitoring well MW6420 will be removed from future reports as the RG for sulfate has been reached and maintained since December 2014.
- The graph for the trend analysis for Site M6 monitoring well MW318 will be removed from future reports as the RG for 2,6-DNT has been reached and maintained since October 2013.
- Further evaluation into the source for the 2,4-DNT and 2,6-DNT exceeding the RG at monitoring well M13-MW362 will be conducted in the 2020 to 2021 timeframe.

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TABLES

TABLE 1-1

Sample Parameters - October 2018
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

Site	Well ID	Parameter
L1	***In-plume***	
	MW131	E
	MW173	E
	WES1	E
	Early Warning	
	MW174	E
	WES3	E
	Compliance	
	SW550	E
L2[1]	***In-plume***	
	MW404	E
	Early Warning	
	MW620	E
	Compliance	
	MW621	E
	SW555	E
L3	***In-plume***	
	MW412	E
	Early Warning	
	MW630	E
	MW631	E
	MW633	E
	Compliance	
	SW777	E
L14[1]	***In-plume***	
	MW511	E
	MW512	E
	Early Warning	
	H7	E
M1	***In-plume***	
	MW107	S
	MW231	S
	MW640	S
	MW641	S
	MW642	S
	Early Warning	
	MW643	S
	MW644	S
	Compliance	
	MW645	S
	MW646	S
	MW649	S
	SW709	S

TABLE 1-1

Sample Parameters - October 2018
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

Site	Well ID	Parameter
M6	***In-plume***	
	MW212R	E
	MW330[2]	S
	MW652	E
	Early Warning	
	MW123R	E
	MW162R	E
	MW313	E
	MW318	E
	MW319	E
	MW654	E
	Compliance	
	MW117	E
	MW118	E
	MW119	E
Landfill M11[1]	***Upgradient***	
	MW802	E, I, M, SVOC & V
	MW803	E, I, M, SVOC & V
	Downgradient	
	MW333	E, I, M, SVOC & V
	MW334	E, I, M, SVOC & V
	MW335	E, I, M, SVOC & V
	MW336	E, I, M, SVOC & V
	MW804	E, I, M, SVOC & V
	MW805	E, I, M, SVOC & V
Landfill M13	***Upgradient***	
	MW806	E, I, M, SVOC & V
	MW807	E, I, M, SVOC & V
	Downgradient	
	MW126R	E, I, M, SVOC & V
	MW362	E, I, M, SVOC & V
	MW808	E, I, M, SVOC & V
	MW809	E, I, M, SVOC & V
	MW811	E, I, M, SVOC & V

Notes:
E = Explosives.
M = Target Analyte List metals.
S = Sulfate.
I = Indicator parameters (nitrate-N and sulfate).
SVOC = Semivolatile organic compound.
V = Volatile organic compound.
Sites L2, L14, and M11 sampled only during Annual round.

Footnotes:
(1) Sites L2, L14, and M11 sampled only during Annual round.
(2) MW330 is an in-plume well for Site M8.

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TABLE 2-1

Summary of Final Field Parameters
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

Site	Monitoring Well ID	Sample Date	Temperature (°C)	pH (SU)	Redox (mV)	Specific Conductivity (mS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)
L1	**In-plume**							
	MW131	4/10/18	9.5	6.65	185	1010	0.8	5.26
		10/1/18	14.9	6.82	187	1120	0.0	2.63
	MW173	4/10/18	5.3	7.09	199	7250	0.0	1.32
		10/1/18	12.4	8.40	-39	918	0.0	2.39
	WES1	4/10/18	10.0	6.87	169	876	0.9	1.25
		10/1/18	13.0	7.06	129	787	0.0	17.13
	Early Warning							
	WES3	4/10/18	8.8	6.86	161	811	1.5	1.19
		10/1/18	14.4	7.01	2	754	0.0	0.74
	MW174	4/10/18	10.2	7.10	187	689	0.0	0.03
		10/1/18	12.9	7.90	94	1010	0.0	1.93
	Compliance							
	SW550	4/9/18	7.0	8.29	197	670	0.0	14.28
		10/1/18	19.6	8.28	70	705	0.0	11.03
L2[(1)]	**In-plume**							
	MW404	10/4/2018	13.7	7.14	35	727	0.0	1.55
	Early Warning							
	MW620	10/4/2018	13.2	7.92	-110	842	0.0	1.40
	Compliance							
	MW621	10/4/2018	12.8	8.11	-1	843	0.0	1.04
	SW555[(3)]	10/4/2018	21.2	8.09	111	7	21.4	5.80
L3	**In-plume**							
	MW412	4/18/18	6.8	7.28	120	776	0.9	6.32
		10/6/18	14.7	7.43	39	798	0.0	1.52
	Early Warning							
	MW630	4/18/18	7.2	7.35	70	660	0.0	2.00
		10/6/18	16.1	7.24	-19	716	0.0	1.28
	MW631	4/18/18	8.2	7.29	96	640	0.0	0.00
		10/6/18	14.7	7.45	-55	666	0.0	1.07
	MW633	4/18/18	6.5	7.16	129	717	1.6	4.93
		10/6/18	14.3	7.27	83	699	0.0	4.87
	Compliance							
	SW777	4/18/18	5.2	7.87	97	682	12.1	2.42
		10/6/18	19.6	8.56	46	635	19.2	6.70
L14[(1)]	**In-plume**							
	MW511	10/1/2018	14.4	6.79	209	963	0.0	3.37
	MW512	10/1/2018	16.3	6.76	214	832	27.7	2.41
	Early Warning							
	H7	10/1/2018	16.7	6.88	234	776	77.2	6.46
M1	**In-plume**							
	MW107	4/13/18	10.2	9.38	-117	8960	0.0	0.00
		10/2/18	15.6	9.30	-144	2460	0.0	1.00
	MW231	4/13/18	8.5	9.41	-203	4910	0.0	0.00
		10/3/18	15.1	9.66	-396	6770	0.0	0.79
	MW640	4/13/18	10.2	6.64	-52	7150	0.1	0.00
		10/2/18	13.6	7.07	-42	6240	0.0	1.42
	MW641	4/10/18	11.3	7.14	-43	1140	0.0	0.00
		10/3/18	17.1	7.43	-128	1750	0.0	1.19
	MW642	4/10/18	9.1	6.94	25	1360	0.4	0.18
		10/3/18	15.8	7.48	-119	1290	0.0	1.30
	Early Warning							
	MW643	4/13/18	8.3	7.21	-54	6680	0.0	1.87
		10/3/18	17.9	7.19	-119	769	0.7	1.22
	MW644	4/13/18	10.5	7.41	145	982	0.0	7.13
		10/3/18	16.7	7.66	43	895	0.0	1.98
	Compliance							
	MW645	4/10/18	7.9	7.26	167	807	0.0	4.73
		10/3/18	15.3	7.28	62	1180	0.0	1.54
	MW646	4/10/18	9.6	7.33	177	910	0.0	5.66
		10/3/18	13.2	7.71	-34	1090	0.0	1.35
	MW649	4/13/18	9.9	7.17	109	688	0.1	1.92
		10/3/18	15.7	7.52	98	858	0.0	1.92
	SW709	4/13/18	14.4	7.90	87	695	2.5	10.44
		10/3/18	18.3	7.70	54	813	1.8	6.10

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TABLE 2-1

Summary of Final Field Parameters
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

Site	Monitoring Well ID	Sample Date	Temperature (°C)	pH (SU)	Redox (mV)	Specific Conductivity (mS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)
M6	**In-plume**							
	MW212R	4/15/18	8.2	7.09	113	2870	0.0	0.00
		10/8/18	17.1	7.42	-22	2260	0.0	4.58
	MW330(2)	4/10/18	12.0	6.76	178	1600	3.6	3.43
		10/8/18	12.8	7.54	95	2040	1.9	4.57
	MW652	4/17/18	8.0	6.98	36	1160	0.0	0.00
		10/4/18	13.1	7.97	4	4930	0.0	1.14
	Early Warning							
	MW123R	4/15/18	9.2	7.00	116	1100	0.0	0.44
		10/4/18	14.4	7.28	-123	1740	0.0	1.02
	MW162R	4/15/18	7.1	7.43	165	478	1.2	8.60
		10/4/18	17.9	7.23	30	750	0.0	2.33
	MW313	4/17/18	8.5	7.37	-3	1620	0.0	0.00
		10/4/18	15.6	7.79	-221	1920	0.0	1.09
	MW318	4/17/18	8.4	6.98	-260	1760	0.2	0.00
		10/4/18	14.4	7.23	-295	1850	0.0	1.17
	MW319	4/17/18	9.6	6.94	-137	1760	0.0	0.00
		10/4/18	12.2	7.79	-303	2540	0.0	1.09
	MW654	4/17/18	8.5	6.79	31	7330	0.0	0.30
		10/4/18	13.5	7.19	-128	4740	0.0	1.48
	Compliance							
	MW117	4/13/18	9.3	7.03	11	4180	0.0	0.00
		10/10/18	16.8	8.16	-159	2470	0.0	1.73
	MW118	4/13/18	9.0	7.23	51	571	0.0	1.51
		10/10/18	17.4	7.61	2	782	0.0	1.08
	MW119	4/13/18	10.3	6.93	144	2140	0.0	0.00
		10/10/18	15.8	7.36	96	2220	1.3	1.30
Landfill M13	**Upgradient**							
	MW806	4/16/18	10.3	7.44	130	829	2.1	2.27
		10/9/18	14.3	8.10	-258	979	0.0	1.16
	MW807	4/16/18	11.5	7.06	-74	3920	0.0	0.19
		10/9/18	13.8	7.82	-180	5410	0.0	1.10
	Downgradient							
	MW126R	4/16/18	10.1	6.88	117	3360	2.5	0.71
		10/9/18	18.2	7.22	199	1340	0.0	1.52
	MW362	4/16/18	13.0	7.00	49	3530	0.0	0.16
		10/9/18	15.3	8.04	45	5860	0.0	1.46
	MW808	4/16/18	9.5	6.88	169	1500	0.0	2.46
		10/9/18	15.5	6.92	139	1810	0.0	1.55
	MW809	4/16/18	9.2	7.68	124	548	1.6	3.40
		10/9/18	13.0	8.35	-91	650	0.0	1.55
	MW811	4/16/18	10.3	7.07	-62	3080	18.9	0.42
		10/9/18	14.5	7.76	-135	4310	14.0	1.77
M11(1)	**Upgradient**							
	MW802	10/2/2018	16.1	7.17	-104	901	0.5	1.19
	MW803	10/2/2018	13.6	7.65	-17	899	0.0	2.11
	Downgradient							
	MW333	10/2/2018	15.4	7.55	86	673	0.0	2.91
	MW334	10/2/2018	13.4	7.26	-187	912	0.0	1.64
	MW335	10/2/2018	13.0	7.42	268	1940	0.0	1.46
	MW336	10/2/2018	12.2	7.18	-87	1810	0.2	1.07
	MW804	10/2/2018	14.0	7.14	-304	1700	0.0	1.17
	MW805	10/2/2018	11.7	7.31	-91	1760	>800(3)	1.51

Notes:
ID = Identification.
R = Replacement well.
°C = Degrees Celsius.
SU = Standard unit.
Redox = Reduction/oxidation potential.
mV = Millivolt.
uS/cm = MicroSiemen per centimeter.
NTU = Nephelometric Turbidity Unit.
mg/L = Milligrams per liter.

Footnotes:
(1) Sites L2, L14, and M11 sampled only during Annual round.
(2) MW330 is an in-plume well for the Manufacturing Area (Site M8).
(3) Purge water was very milky in color causing turbidity to be over the limit of the meter.

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TABLE 2-2

Monitoring Well Information Table - Manufacturing Area
2018 Semi-annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

Site	Monitoring Well ID	Northing (Feet)	Easting (Feet)	TOC Elevation (MSL)	Ground Elevation (MSL)	Depth to Top of Screen (BGS)	Depth to Bottom of Screen (BGS)	Total Borehole Depth (BGS)	Depth to Water April 2018 (TOC)	Water Elevation April 2018 (MSL)	Depth to Water October 2018 (TOC)	Water Elevation October 2018 (MSL)	Depth to Bedrock From Log (BGS)	Bedrock Elevation from Log (MSL)	Year Installed	Formation Designation	Screen Length (Feet)	Casing & Screen Diameter (Inches)
M1	MW104	15019989.4	1318790.5	549.10	546.20	7.0	27.0	30.0	5.70	543.40	9.03	540.07	27.0	519.2	1981	OVB	20.0	4.0
	MW105	15020111.7	1320854.1	555.00	552.50	7.0	27.0	29.9	5.25	549.75	9.34	545.66	24.0	528.5	1981	COMBO	20.0	4.0
	MW106[1]	15020948.8	1318761.3	542.00	539.70	10.0	30.0	32.0	3.38	538.62	**NM**	**NM**	21.0	518.7	1981	COMBO	20.0	4.0
	MW107	15021094.2	1320422.3	552.40	549.10	5.5	25.5	27.4	5.26	547.14	8.62	543.78	17.0	532.1	1981	COMBO	20.0	4.0
	MW201	15020020.6	1318931.6	546.15	544.01	46.5	66.5	70.5	2.77	543.38	6.24	539.91	24.0	520.0	1988	BRK	20.0	4.0
	MW231	15020828.1	1319861.0	550.33	548.47	6.0	16.0	15.7	2.92	547.41	5.58	544.75	16.0	532.5	1988	OVB	10.0	4.0
	MW347[1]	15020481.0	1319595.0	551.73	549.84	14.4	24.4	27.0	**NM**	**NM**	**NM**	**NM**	18.5	531.3	1991	COMBO	10.0	4.0
	MW351	15021257.8	1319798.9	548.38	545.68	9.5	19.5	22.7	4.85	543.53	7.70	540.68	22.5	523.2	1991	OVB	10.0	4.0
	MW640	15021244.2	1319804.0	548.12	545.40	29.0	39.0	40.0	3.75	544.37	6.74	541.38	23.0	522.4	1999	BRK	10.0	4.0
	MW641	15021873.5	1319350.2	544.50	541.98	7.0	17.0	17.2	2.12	542.38	5.06	539.44	29.0	516.1	1999	OVB	10.0	4.0
	MW642	15021874.4	1319339.9	544.47	541.95	29.0	39.0	40.0	2.61	541.86	5.59	538.88	29.0	516.1	1999	BRK	10.0	4.0
	MW643	15022117.7	1318719.9	540.03	537.55	4.3	7.2	7.8	5.96	534.07	7.92	532.11	7.3	530.3	2001	OVB	2.9	4.0
	MW644	15022128.9	1318718.6	540.23	537.55	10.8	20.4	21.0	5.90	534.33	7.85	532.38	7.3	530.3	2001	BRK	9.6	4.0
	MW645	15022269.1	1318648.7	541.47	538.90	7.5	11.5	12.0	8.39	533.08	10.38	531.09	10.5	528.4	2001	OVB	4.0	4.0
	MW646	15022257.3	1318650.5	541.48	539.09	12.3	21.9	22.5	8.35	533.13	10.11	531.37	10.5	528.6	2001	BRK	9.6	4.0
	MW647[1]	15022572.9	1318013.0	538.40	535.96	7.3	16.9	17.5	**NM**	**NM**	**NM**	**NM**	6.0	530.0	2001	BRK	9.6	4.0
	MW648[1]	15022428.3	1319438.1	546.77	544.17	7.3	16.8	17.4	**NM**	**NM**	**NM**	**NM**	13.5	530.7	2001	OVB	9.6	4.0
	MW649	15021299.5	1318723.2	543.10	540.49	7.0	16.6	17.2	5.88	537.22	9.79	533.31	7.5	533.0	2001	COMBO	9.6	4.0
M3	MW111[1]	15028903.0	1318551.6	531.80	529.40	10.5	54.0	54.0	**NM**	**NM**	**NM**	**NM**	10.0	519.4	1981	BRK	43.5	4.0
	MW112[1]	15030353.7	1318557.9	534.10	531.70	7.2	27.2	29.0	**NM**	**NM**	**NM**	**NM**	8.0	523.7	1981	BRK	20.0	4.0
	MW113	15030379.5	1319676.1	536.32	533.70	7.2	27.2	28.0	3.83	532.49	8.43	527.89	5.0	528.7	1981	BRK	20.0	4.0
	MW154[1]	15027749.6	1318572.5	533.06	529.15	5.5	9.1	9.1	**NM**	**NM**	**NM**	**NM**	8.0	521.2	1982	COMBO	3.6	4.0
	MW203[1]	15029235.4	1318551.2	534.23	532.02	10.5	25.5	25.5	**NM**	**NM**	**NM**	**NM**	5.5	526.5	1988	BRK	15.0	4.0
	MW232[1]	15030123.9	1318974.4	535.79	533.38	20.0	35.0	37.0	**NM**	**NM**	**NM**	**NM**	7.0	526.4	1988	BRK	15.0	4.0
	MW233[1]	15029737.9	1319024.9	535.58	532.96	10.0	25.0	25.5	**NM**	**NM**	**NM**	**NM**	2.5	530.5	1988	BRK	15.0	4.0
	MW348[1]	15029911.3	1318978.0	535.71	532.61	16.5	31.5	35.0	**NM**	**NM**	**NM**	**NM**	3.0	529.6	1991	BRK	15.0	4.0
	MW352[1]	15029602.8	1318617.3	534.89	532.33	19.0	34.0	34.5	**NM**	**NM**	**NM**	**NM**	6.0	526.3	1991	BRK	15.0	4.0
	MW353[1]	15030120.6	1318562.3	534.64	531.86	17.0	32.0	34.0	**NM**	**NM**	**NM**	**NM**	2.0	529.9	1991	BRK	15.0	4.0
M4	MW115[1]	15032589.5	1318485.3	533.40	530.80	7.2	27.2	28.0	4.68	528.72	**NM**	**NM**	2.0	528.8	1981	BRK	20.0	4.0
	MW157	15032947.3	1319827.0	535.02	531.37	3.7	10.2	10.5	2.39	532.63	3.08	531.94	6.5	524.9	1982	COMBO	6.5	2.0
	MW158	15032970.9	1319820.0	534.40	531.58	9.0	29.5	31.9	2.15	532.25	3.80	530.60	5.0	526.6	1982	BRK	20.5	3.0
M5	MW114R[1]	15031315.3	1323651.6	556.80	554.9	6.5	21.5	22.0	**NM**	**NM**	**NM**	**NM**	15.0	539.9	2001	COMBO	15.0	4.0
	MW127R[1]	15032537.2	1326273.8	596.04	592.9	30.0	45.0	46.0	**NM**	**NM**	**NM**	**NM**	40.0	552.9	2001	COMBO	15.0	4.0
	MW207R	15032188.9	1323779.7	560.21	557.5	7.0	17.0	18.0	12.06	548.15	12.11	548.10	15.5[2]	542.0[2]	2001	OVB	10.0	4.0
	MW354R[1]	15031780.2	1323424.2	559.61	557.6	7.0	17.0	18.0	**NM**	**NM**	**NM**	**NM**	19.0	538.6	2001	OVB	10.0	4.0
	MW355R[1]	15030827.1	1323676.8	558.12	555.7	10.0	20.0	22.0	**NM**	**NM**	**NM**	**NM**	15.0	540.7	2001	COMBO	10.0	4.0
	MW356R	15031372.5	1322054.0	558.08	556.1	24.5	34.5	35.0	16.94	541.14	18.14	539.94	20.0	536.1	2001	BRK	10.0	4.0
M6	MW122	15038443.3	1321305.0	540.10	537.40	7.0	27.0	27.5	4.07	536.03	4.55	535.55	6.5	530.9	1981	BRK	20.0	4.0
	MW123R	15035314.9	1320626.1	537.22	534.9	15.0	30.0	32.0	4.65	532.57	5.04	532.18	10.0	524.9	2001	BRK	15.0	4.0
	MW125R	15037201.5	1322981.6	567.69	565.1	12.0	32.0	33.0	14.64	553.05	14.71	552.98	26.0	539.1	2001	COMBO	20.0	4.0
	MW160	15034274.9	1321203.9	542.29	538.20	3.3	6.3	10.4	5.53	536.76	5.55	536.74	6.0	532.2	1982	OVB	3.0	2.0
	MW162R	15035325.7	1320625.8	540.19	537.7	4.5	9.5	10.0	4.94	535.25	4.56	535.63	3.7[2]	534.0[2]	2001	COMBO	5.0	4.0
	MW164[1]	15037035.7	1321868.5	545.21	541.69	3.0	6.0	9.7	5.56	539.65	**NM**	**NM**	6.0	535.7	1982	OVB	3.0	4.0
	MW165	15037644.2	1321700.3	544.01	540.31	2.8	5.3	9.0	5.17	538.84	8.38	535.63	5.0	535.3	1982	OVB	2.5	4.0
	MW166R	15039129.4	1322675.0	558.21	555.6	10.0	20.0	21.0	12.68	545.53	13.38	544.83	**UNKNOWN**	**UNKNOWN**	2001	OVB	10.0	4.0
	MW208[1]	15035028.4	1320126.9	538.38	535.10	12.0	27.0	30.1	4.85	533.53	6.94	531.44	4.0	531.1	1988	BRK	15.0	4.0
	MW209	15037473.3	1320271.3	537.75	534.89	19.5	34.5	34.5	3.39	534.36	**NM**	**NM**	11.1	523.8	1988	BRK	15.0	4.0
	MW210R	15035465.0	1322154.0	565.83	564.30	10.7	20.0	20.0	10.80	555.03	17.24	548.59	**NE**	**NE**	1998	OVB	10.0	4.0
	MW212R	15035415.0	1321862.0	564.87	565.30	9.5	19.5	21.0	10.94	553.93	10.93	553.94	**NE**	**NE**	1998	OVB	10.0	4.0
	MW213R	15035462.0	1322159.0	566.49	564.30	38.0	53.0	54.0	19.06	547.43	19.59	546.90	30.5	533.8	1998	BRK	15.0	4.0

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TABLE 2-2

Monitoring Well Information Table - Manufacturing Area
2018 Semi-annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

Site	Monitoring Well ID	Northing (Feet)	Easting (Feet)	TOC Elevation (MSL)	Ground Elevation (MSL)	Depth to Top of Screen (BGS)	Depth to Bottom of Screen (BGS)	Total Borehole Depth (BGS)	Depth to Water April 2018 (TOC)	Water Elevation April 2018 (MSL)	Depth to Water October 2018 (TOC)	Water Elevation October 2018 (MSL)	Depth to Bedrock From Log (BGS)	Bedrock Elevation from Log (MSL)	Year Installed	Formation Designation	Screen Length (Feet)	Casing & Screen Diameter (Inches)
M6	MW215R	15035410.0	1321863.0	564.75	565.30	38.5	53.5	54.5	17.72	547.03	18.40	546.35	30.0	535.3	1998	BRK	15.0	4.0
	MW307	15033821.0	1321855.8	563.56	561.45	17.0	27.0	31.7	19.63	543.93	19.70	543.86	**NE**	**NE**	1991	OVB	10.0	4.0
	MW308	15033810.7	1321837.6	563.84	561.38	50.5	65.5	71.8	21.74	542.10	22.09	541.75	35.0	526.4	1991	BRK	15.0	4.0
	MW309	15034826.8	1321825.3	565.87	563.43	12.7	27.7	30.6	10.83	555.04	10.77	555.10	30.0	533.4	1991	OVB	15.0	4.0
	MW310R	15034823.0	1321824.0	565.97	563.00	44.5	59.5	60.0	22.28	543.69	22.65	543.32	31.0	532.0	1998	BRK	15.0	4.0
	MW311	15038100.4	1322342.5	557.08	546.36	14.0	24.0	26.4	9.05	548.03	9.13	547.95	7.0	539.4	1991	BRK	10.0	4.0
	MW312	15038100.6	1322332.5	555.92	545.96	40.0	55.0	58.1	7.72	548.20	8.19	547.73	7.0	539.0	1991	BRK	15.0	4.0
	MW313	15037051.7	1321934.0	551.07	549.20	25.0	40.0	40.9	11.13	539.94	12.65	538.42	12.0	537.2	1991	BRK	15.0	4.0
	MW314	15034383.6	1321451.5	542.32	539.53	9.7	14.7	17.8	5.43	536.89	5.45	536.87	7.2	532.3	1991	BRK	5.0	4.0
	MW315	15034394.6	1321451.7	541.60	538.91	29.7	44.7	47.9	4.63	536.97	4.77	536.83	6.5	532.4	1991	BRK	15.0	4.0
	MW316	15036232.3	1321257.1	542.89	540.49	13.0	18.0	20.9	5.89	537.00	6.88	536.01	7.5	533.0	1991	BRK	5.0	4.0
	MW317	15036222.4	1321257.7	542.96	540.71	34.0	49.0	49.0	6.23	536.73	6.54	536.42	8.0	532.7	1991	BRK	15.0	4.0
	MW318	15037189.7	1321488.6	547.67	545.23	11.8	21.8	24.2	9.50	538.17	10.87	536.80	11.5	533.7	1991	BRK	10.0	4.0
	MW319	15037202.6	1321489.8	548.10	545.49	40.0	55.0	57.0	9.68	538.42	10.98	537.12	12.0	533.5	1991	BRK	15.0	4.0
	MW320R	15039129.7	1322656.0	557.09	554.6	30.5	45.5	46.0	11.34	545.75	12.11	544.98	8.0(2)	546.6(2)	2001	BRK	15.0	4.0
	MW650	15037950.2	1322588.0	566.45	563.83	12.0	22.0	22.5	9.91	556.54	10.80	555.65	23.0(2)	560.8(2)	1999	OVB	10.0	4.0
	MW651	15037939.2	1322583.7	566.88	563.83	36.0	46.0	47.0	17.83	549.05	18.29	548.59	23.0	560.8	1999	BRK	10.0	4.0
	MW652	15037004.9	1322243.1	565.03	561.93	11.0	21.0	22.0	10.01	555.02	11.89	553.14	25.0(2)	536.9(2)	1999	OVB	10.0	4.0
	MW653	15036994.6	1322239.1	564.60	561.93	36.0	46.0	47.0	17.40	547.20	17.89	546.71	25.0	536.9	1999	BRK	10.0	4.0
	MW654	15037070.8	1321976.9	551.15	548.49	13.0	23.0	24.0	11.25	539.90	13.26	537.89	10.5	539.0	1999	BRK	10.0	4.0
	MW655	15034232.3	1320633.2	540.19	537.71	**UNKNOWN**	**UNKNOWN**	**UNKNOWN**	5.68	534.51	6.52	533.67	5.0	532.7	1999	BRK(3)	**UNKNOWN**	4.0
	MW662	15039862.6	1321841.5	547.56	**UNKNOWN**	6.0	16.0	18.0	7.23	540.33	6.87	540.69	20.0	**UNKNOWN**	2001	OVB	10.0	4.0
	MW663	15039854.9	1321841.4	547.86	**UNKNOWN**	30.0	40.0	41.0	7.45	540.41	7.33	540.53	20.0	**UNKNOWN**	2001	BRK	10.0	4.0
	MW664	15040136.6	1322326.4	547.43	**UNKNOWN**	5.0	10.0	10.5	6.89	540.54	7.65	539.78	10.0	**UNKNOWN**	2001	OVB	5.0	4.0
	MW665	15040145.7	1322327.5	546.98	**UNKNOWN**	28.0	38.0	40.0	3.67	543.31	4.54	542.44	10.0	UNKNOWN	2001	BRK	10.0	4.0
M7	MW124R	15033133.0	1320756.0	537.25	534.70	6.0	16.0	16.0	1.48	535.77	2.13	535.12	5.0	529.7	1998	BRK	10.0	4.0
	MW156	15032408.6	1321713.5	541.35	537.45	1.7	5.2	5.4	4.41	536.94	4.22	537.13	5.3	532.2	1982	OVB	3.5	4.0
	MW159(1)	15033457.9	1320537.1	537.80	533.54	4.4	9.4	12.8	**NM**	**NM**	**NM**	**NM**	5.7	527.8	1982	COMBO	5.0	4.0
	MW216	15033525.6	1320650.6	538.03	536.51	5.0	10.0	36.7	4.86	533.17	6.64	531.39	11.0	525.5	1988	OVB	5.0	4.0
	MW217	15033449.7	1320652.6	538.97	536.90	19.5	34.5	12.0	4.42	534.55	4.11	534.86	13.4	523.5	1988	BRK	15.0	4.0
	MW660	15032597.2	1320677.4	539.73	537.08	7.0	12.0	12.6	4.75	534.98	5.80	533.93	**UNKNOWN**	**UNKNOWN**	1999	OVB(4)	5.0	4.0
	MW661	15032587.2	1320679.2	539.57	537.09	20.0	30.0	30.0	6.17	533.40	5.64	533.93	**UNKNOWN**	**UNKNOWN**	1999	OVB(4)	10.0	4.0
M8	MW121	15040140.8	1323725.5	575.75	572.50	10.0	30.0	14.2	18.38	557.37	19.11	556.64	**NE**	**NE**	1981	OVB	20.0	4.0
	MW147R	15037926.9	1323318.0	567.82	564.0	6.5	21.5	22.0	11.18	556.64	11.92	555.90	**NE**	**NE**	2001	OVB	15.0	4.0
	MW148RR	15038954.5	1323542.2	561.59	560.7	8.0	23.0	23.5	15.29	546.30	15.32	546.27	18.0	542.7	2001	COMBO	15.0	4.0
	MW323R	15036514.7	1323739.7	566.00	563.5	8.0	18.0	18.5	10.80	555.20	10.22	555.78	**NE**	**NE**	2001	OVB	10.0	4.0
	MW324R(1)	15038125.4	1323502.9	566.23	562.7	9.5	19.5	20.0	14.39	551.84	**NM**	**NM**	**NE**	**NE**	2001	OVB	10.0	4.0
	MW325R	15036105.4	1322633.3	569.62	566.9	7.0	17.0	18.0	12.74	556.88	13.68	555.94	**NE**	**NE**	2001	OVB	10.0	4.0
	MW328(1)	15040352.8	1323793.0	582.93	580.72	18.0	28.0	19.7	24.30	558.63	**NM**	**NM**	**NE**	**NE**	1991	OVB	10.0	4.0
	MW330	15040218.4	1323970.2	580.33	578.20	15.0	25.0	17.0	22.24	558.09	22.80	557.53	**NE**	**NE**	1991	OVB	10.0	4.0
Other Areas	MW117	15036450.2	1318407.7	529.10	526.90	7.7	27.7	27.7	2.75	526.35	3.33	525.77	12.0	514.9	1981	COMBO	20.0	4.0
	MW116	15034538.6	1318460.3	535.20	532.60	7.0	27.0	27.0	3.37	531.83	7.10	528.10	5.0	527.6	1981	BRK	20.0	4.0
	MW118	15039343.5	1318362.2	534.00	531.20	8.0	23.0	23.0	3.20	530.80	3.22	530.78	2.5	528.7	1981	BRK	15.0	4.0
	MW119	15040962.1	1320127.9	538.90	535.50	3.3	23.3	25.5	8.80	530.10	6.01	532.89	6.0	529.5	1981	COMBO	20.0	4.0

TABLE 2-2

Monitoring Well Information Table - Manufacturing Area
2018 Semi-annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

Site	Monitoring Well ID	Northing (Feet)	Easting (Feet)	TOC Elevation (MSL)	Ground Elevation (MSL)	Depth to Top of Screen (BGS)	Depth to Bottom of Screen (BGS)	Total Borehole Depth (BGS)	Depth to Water April 2018 (TOC)	Water Elevation April 2018 (MSL)	Depth to Water October 2018 (TOC)	Water Elevation October 2018 (MSL)	Depth to Bedrock From Log (BGS)	Bedrock Elevation from Log (MSL)	Year Installed	Formation Designation	Screen Length (Feet)	Casing & Screen Diameter (Inches)
M13	AEHA14R	15034927.3	1322519.9	569.73	567.03	16.5	26.5	27.0	12.95	556.78	17.81	551.92	**UNKNOWN**	**UNKNOWN**	2001	OVB	10.0	4.0
	MW126R	15034092.6	1323332.3	562.41	563.00	11.0	21.0	22.0	15.33	547.08	15.66	546.75	NE	NE	2004	OVB	10.0	4.0
	MW321	15033167.5	1321626.5	545.55	542.93	13.5	23.5	26.6	6.47	539.08	7.07	538.48	9.5	533.4	1991	BRK	10.0	4.0
	MW322	15033161.0	1321640.2	544.54	542.26	34.5	49.5	51.5	9.29	535.25	11.08	533.46	9.0	533.3	1991	BRK	15.0	4.0
	MW350(1)	15032810.1	1321811.0	554.34	552.34	12.5	22.5	24.8	15.28	539.06	**NM**	**NM**	19.0	533.3	1991	COMBO	10.0	4.0
	MW362	15034100.6	1323339.4	562.46	562.78	28.0	33.0	34.0	13.44	549.02	13.46	549.00	29.5	533.3	2004	COMBO	5.0	4.0
	MW363	15032768.3	1322536.0	570.03	567.66	21.0	31.0	32.0	27.80	542.23	28.25	541.78	31.5	536.2	2004	OVB	10.0	4.0
	MW364	15032775.4	1322527.2	569.82	567.69	37.0	42.0	42.5	27.61	542.21	28.06	541.76	31.5	536.2	2004	BRK	5.0	4.0
	MW806	15034807.2	1323337.9	565.53	**UNKNOWN**	15.0	25.0	25.0	14.04	551.49	13.67	551.86	29.0	**UNKNOWN**	2008	OVB	10.0	4.0
	MW807	15034817.4	1323338.1	565.79	**UNKNOWN**	35.0	45.0	45.0	15.88	549.91	14.75	551.04	29.0	**UNKNOWN**	2008	BRK	10.0	4.0
	MW808	15034539.9	1322493.1	569.23	**UNKNOWN**	15.0	25.0	25.0	16.05	553.18	17.64	551.59	30.0	**UNKNOWN**	2008	OVB	10.0	4.0
	MW809	15034530.2	1322492.9	569.18	**UNKNOWN**	35.0	45.0	45.0	20.12	549.06	20.16	549.02	30.0	**UNKNOWN**	2008	BRK	10.0	4.0
	MW811	15034212.0	1323111.7	568.24	565.60	20.0	30.0	30.2	21.12	547.12	22.77	545.47	30.2	535.4	2014	OVB	10.0	2.0
M11(5)	MW108(1)	15025248.1	1320261.2	543.60	540.80	7.0	27.0	27.0	**NM**	**NM**	**NM**	**NM**	9.0	531.8	1981	COMBO	20.0	4.0
	MW333	15026529.4	1319776.9	536.41	533.63	17.9	32.9	34.5	**NM**	**NM**	5.54	530.87	5.0	528.6	1991	BRK	15.0	4.0
	MW334	15025998.4	1319521.8	536.22	533.40	19.0	34.0	35.0	**NM**	**NM**	6.29	529.93	5.0	528.4	1991	BRK	15.0	4.0
	MW335	15025671.9	1319364.8	538.36	535.66	9.4	19.4	19.5	**NM**	**NM**	8.84	529.52	6.0	529.7	1991	BRK	10.0	4.0
	MW336	15025322.1	1319223.4	537.28	534.79	12.0	22.0	23.5	**NM**	**NM**	11.36	525.92	7.5	527.3	1991	BRK	10.0	4.0
	MW337(1)	15024992.0	1319103.4	536.96	534.32	21.1	36.1	35.0	**NM**	**NM**	**NM**	**NM**	6.5	527.8	1991	BRK	15.0	4.0
	MW338(1)	15024414.1	1318777.5	537.73	534.70	13.5	28.5	30.5	**NM**	**NM**	**NM**	**NM**	3.0	531.7	1991	BRK	15.0	4.0
	MW339(1)	15023897.9	1318660.6	541.27	538.41	9.7	19.7	20.0	**NM**	**NM**	**NM**	**NM**	9.0	529.4	1991	BRK	10.0	4.0
	MW340(1)	15023157.7	1318683.2	542.47	539.83	7.0	17.0	22.0	**NM**	**NM**	**NM**	**NM**	10.0	529.8	1991	COMBO	10.0	4.0
	MW802	15025690.0	1320235.7	543.42	541.62	5.0	15.0	15.0	**NM**	**NM**	9.70	533.72	9.5	532.1	2008	COMBO	10.0	4.0
	MW803	15025697.7	1320237.5	543.66	541.56	26.5	36.5	36.5	**NM**	**NM**	2.73	540.93	9.5	532.1	2008	BRK	10.0	4.0
	MW804	15025916.1	1319219.3	536.48	533.78	5.0	15.0	15.0	**NM**	**NM**	9.40	527.08	3.5	530.3	2008	BRK	10.0	4.0
	MW805	15025913.6	1319229.6	536.27	533.62	25.0	35.0	35.0	**NM**	**NM**	8.72	527.55	3.5	530.1	2008	BRK	10.0	4.0

Notes:

ID = Identification.

Coordinates are Universal Transverse Mercator (UTM), Zone 16 North, North American Datum 1983 (NAD83).

MSL = Feet relative to mean sea level.

BGS = Feet below ground surface.

TOC = Top of casing.

OVB = Overburden.

COMBO = Combination overburden/bedrock well.

BRK = Bedrock.

NM = Water level not measured.

UNKNOWN = Indicate data not presented on borelogs or provided in Remedial Investigation/Feasibility Study documentation.

NE = Not encountered.

Footnotes:

(1) Monitoring well abandoned in April 2018 (MW115 abandonded in July 2018).

(2) Bedrock elevation from depth to bedrock from boring log for original monitoring well or the depth to bedrock from nested monitoring well.

(3) Designation assumed based on shallow depth to bedrock, screen length unknown.

(4) Designation assumed, depth to bedrock unknown.

(5) Site M11 measured only during Annual round.

TABLE 2-3

Monitoring Well Information Table - Load-Assemble-Package Area
2018 Semi-annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

Site	Monitoring Well ID	Northing (Feet)	Easting (Feet)	TOC Elevation (MSL)	Ground Elevation (MSL)	Depth to Top of Screen (BGS)	Depth to Bottom of Screen (BGS)	Total Borehole Depth (BGS)	Depth to Water April 2018 (TOC)	Water Elevation April 2018 (MSL)	Depth to Water October 2018 (TOC)	Water Elevation October 2018 (MSL)	Depth to Bedrock From Log (BGS)	Bedrock Elevation from Log (MSL)	Year Installed	Well Designation	Screen Length (Feet)	Casing & Screen Diameter (Inches)
L1	MW131	15029483.2	1344039.1	625.01	622.29	2.5	22.5	24.0	14.04	610.97	19.16	605.85	**NE**	**NE**	1981	OVB	20.0	4.0
	MW171	15028774.7	1343406.0	618.24	615.03	2.9	7.9	11.1	8.61	609.63	10.75	607.49	8.0	607.0	1982	OVB	5.0	4.0
	MW172	15028836.8	1344094.1	615.87	613.19	14.5	34.5	37.5	10.74	605.13	10.83	605.04	11.0	602.2	1982	BRK	20.0	4.0
	MW173	15028827.3	1344123.2	615.56	612.56	2.8	11.8	15.2	8.38	607.18	10.61	604.95	12.0	600.6	1982	OVB	9.0	3.6
	MW174	15028974.9	1344649.5	615.32	612.40	3.5	14.5	18.1	8.23	607.09	10.11	605.21	15.0	597.4	1982	OVB	11.0	3.6
	MW175	15029420.7	1343046.6	634.45	630.96	3.7	19.7	23.2	13.08	621.37	22.96	611.49	20.0	611.0	1982	OVB	16.0	3.6
	MW176	15030320.6	1343491.6	646.77	643.49	4.8	20.8	23.6	21.45	625.32	**DRY**	**DRY**	20.8	622.7	1982	OVB	16.0	3.6
	MW177	15028773.3	1343380.2	616.29	613.84	11.8	31.0	33.4	7.75	608.54	10.61	605.68	6.5	607.3	1983	BRK	19.2	3.0
	MW178	15030330.0	1343512.0	643.83	640.39	27.3	46.5	50.1	24.77	619.06	36.18	607.65	20.0	620.4	1983	BRK	19.2	3.0
	MW400[(1)]	15030872.2	1344840.2	655.17	652.56	16.2	26.2	28.6	**NM**	**NM**	**NM**	**NM**	21.0	631.6	1991	COMBO	10.0	4.0
	MW401	15028228.2	1344007.5	611.96	610.20	28.5	43.5	46.1	6.70	605.26	7.56	604.40	16.0	594.2	1991	BRK	15.0	4.0
	WES1	15029404.2	1343978.5	623.13	621.43	20.0	40.0	40.0	12.43	610.70	16.92	606.21	20.0	601.4	1997	BRK	20.0	4.0
	WES2	15029874.9	1343699.2	637.69	635.98	22.0	42.0	42.0	22.52	615.17	30.78	606.91	22.0	614.0	1997	BRK	20.0	4.0
	WES3	15028686.7	1344093.6	611.69	610.33	20.0	40.0	40.0	4.81	606.88	6.74	604.95	20.0	590.3	1997	BRK	20.0	4.0
	MW610	15028213.1	1344005.1	612.63	609.62	4.0	14.0	14.0	7.16	605.47	9.22	603.41	16.0[(2)]	594.2[(2)]	1999	OVB	10.0	4.0
	MW611[(1)]	15027976.1	1344327.6	620.45	617.83	10.0	20.0	21.0	9.02	611.43	**NM**	**NM**	**NE**	**NE**	1999	OVB	10.0	4.0
L2[(3)]	MW132	15026868.2	1339653.6	612.30	609.84	7.5	27.5	29.4	**NM**	**NM**	9.59	602.71	18.0	591.8	1981	COMBO	20.0	4.0
	MW133	15026726.5	1338362.5	605.88	603.51	7.2	27.2	28.7	**NM**	**NM**	6.03	599.85	19.5	584.0	1981	COMBO	20.0	4.0
	MW134[(1)]	15025646.6	1338233.8	613.30	609.70	6.7	26.7	27.1	**NM**	**NM**	**NM**	**NM**	**NE**	**NE**	1981	OVB	20.0	4.0
	MW135	15025761.1	1339631.8	637.35	634.18	6.0	26.0	27.0	**NM**	**NM**	14.89	622.46	**NE**	**NE**	1981	OVB	20.0	4.0
	MW404	15026798.8	1338548.5	605.88	604.09	7.7	17.7	20.5	**NM**	**NM**	6.13	599.75	12.0	592.1	1991	COMBO	10.0	4.0
	MW405	15027072.9	1338771.8	607.21	605.16	10.8	20.8	23.5	**NM**	**NM**	7.36	599.85	16.0	589.2	1991	COMBO	10.0	4.0
	MW406	15026560.8	1339282.3	623.13	620.72	23.8	33.8	35.7	**NM**	**NM**	20.39	602.74	29.0	591.7	1991	COMBO	10.0	4.0
	MW407[(1)]	15026676.1	1339269.1	620.05	618.30	20.5	30.5	33.9	**NM**	**NM**	**NM**	**NM**	25.5	592.8	1991	COMBO	10.0	4.0
	MW501[(1)]	15025985.9	1338411.0	617.05	614.72	12.7	22.7	**NA**	**NM**	**NM**	**NM**	**NM**	25.0	589.7	1991	OVB	10.0	4.0
	MW620	15027048.6	1338602.4	605.07	602.41	7.0	17.0	18.0	**NM**	**NM**	5.52	599.55	**UNKNOWN**	**UNKNOWN**	1999	OVB	10.0	4.0
	MW621	15027058.7	1338599.0	604.96	602.41	22.0	32.0	32.8	**NM**	**NM**	5.05	599.91	20.0	582.4	1999	BRK	10.0	4.0
	MW810[(1)]	15027142.7	1338476.8	604.58	601.91	7.0	17.3	18.0	**NM**	**NM**	**NM**	**NM**	**NE**	**NE**	2009	OVB	10.0	4.0
L3	MW1[(1)]	15025237.0	1338193.5	630.63	628.68	16.5	26.5	27.8	12.97	617.66	**NM**	**NM**	**NE**	**NE**	1986	OVB	10.0	2.0
	MW3[(1)]	15025504.3	1337801.7	610.34	608.50	9.0	19.0	20.9	2.52	607.82	**NM**	**NM**	19.0	589.5	1986	OVB	10.0	2.0
	MW136	15024523.1	1337305.7	602.70	600.8	7.2	27.2	**NA**	4.88	597.82	10.99	591.71	11.0	589.8	1981	COMBO	20.0	4.0
	MW137[(1)]	15024661.0	1338608.6	632.90	631.40	7.0	27.0	28.7	2.63	630.27	**NM**	**NM**	**NE**	**NE**	1981	OVB	20.0	4.0
	MW412	15024596.0	1337101.4	599.14	597.41	7.4	17.4	19.2	3.80	595.34	9.59	589.55	3.0	594.4	1991	BRK	10.0	4.0

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J:\2028A USACE JOAAP\03.00 Deliverables\03.06 Reports 2018\03.06.03 Annual Report\03.06.03.03 FINAL Annual Report\Parts\Tables\Table 2-3_2018 Annual Monitoring Well Information Table - LAP Area.xlsx

TABLE 2-3

Monitoring Well Information Table - Load-Assemble-Package Area
2018 Semi-annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

Site	Monitoring Well ID	Northing (Feet)	Easting (Feet)	TOC Elevation (MSL)	Ground Elevation (MSL)	Depth to Top of Screen (BGS)	Depth to Bottom of Screen (BGS)	Total Borehole Depth (BGS)	Depth to Water April 2018 (TOC)	Water Elevation April 2018 (MSL)	Depth to Water October 2018 (TOC)	Water Elevation October 2018 (MSL)	Depth to Bedrock From Log (BGS)	Bedrock Elevation from Log (MSL)	Year Installed	Well Designation	Screen Length (Feet)	Casing & Screen Diameter (Inches)
L3	MW630	15024770.2	1337013.7	595.06	592.23	7.0	12.0	12.7	6.15	588.91	7.24	587.82	4.0	588.2	1999	BRK	5.0	4.0
	MW631	15024764.6	1337010.7	595.09	592.23	16.0	26.0	27.0	3.51	591.58	6.02	589.07	4.0	588.2	1999	BRK	10.0	4.0
	MW632(1)	15024828.6	1336912.4	606.25	603.75	12.0	27.2	27.5	14.78	591.47	**NM**	**NM**	9.5	594.3	2009	BRK	15.0	4.0
	MW633	15024474.5	1336978.4	600.37	597.90	7.0	17.0	18.0	5.80	594.57	11.64	588.73	5.0	592.9	1999	BRK	10.0	4.0
L14(3)	H-7	15019448.6	1332662.8	584.62	581.45	4.0	14.0	15.5	**NM**	**NM**	11.51	573.11	12.0	569.5	1982	OVB	10.0	2.0
	H-8	15019409.6	1333457.3	591.40	588.14	7.0	22.0	22.9	**NM**	**NM**	14.30	577.10	20.0	568.1	1982	OVB	15.0	2.0
	MW140	15018819.7	1332901.8	584.59	581.68	7.0	27.0	30.3	**NM**	**NM**	11.34	573.25	22.0	559.7	1981	COMBO	20.0	4.0
	MW508	15019632.4	1333106.2	587.44	585.34	10.0	20.0	22.9	**NM**	**NM**	10.26	577.18	**NE**	**NE**	1993	OVB	10.0	4.0
	MW511	15019645.9	1333029.6	587.45	584.98	4.0	14.0	17.0	**NM**	**NM**	10.76	576.69	16.0	569.0	1997	OVB	10.0	4.0
	MW512	15019541.1	1333111.1	588.04	585.98	5.0	15.0	18.2	**NM**	**NM**	10.80	577.24	16.0	570.0	1997	OVB	10.0	4.0
	MW600	15019920.1	1332928.6	587.22	584.75	6.0	11.0	11.0	**NM**	**NM**	10.29	576.93	11.0	573.8	1998	OVB	5.0	2.0
	MW601	15019196.3	1333121.3	586.72	584.29	9.0	19.0	20.0	**NM**	**NM**	10.69	576.03	19.6	564.7	1998	OVB	10.0	2.0
	MW602	15019432.7	1332663.5	583.83	581.22	21.0	31.0	31.0	**NM**	**NM**	12.43	571.40	12.0	569.2	1999	BRK	10.0	4.0
	MW603	15019323.8	1332379.6	580.77	578.27	6.0	16.0	16.0	**NM**	**NM**	10.50	570.27	13.0	565.3	1999	COMBO	10.0	4.0
	MW604	15019335.9	1332379.4	581.12	578.27	20.0	30.0	31.0	**NM**	**NM**	10.68	570.44	13.0	565.3	1999	BRK	10.0	4.0

Notes:

ID = Identification.

Coordinates are Universal Transverse Mercator (UTM), Zone 16 North, North American Datum 1983 (NAD83).

MSL = Feet relative to mean sea level.

BGS = Feet below ground surface.

TOC = Top of casing.

NE = Not encountered.

OVB = Overburden.

BRK = Bedrock.

NM = Water level not measured.

COMBO = Combination overburden/bedrock well.

UNKNOWN = Indicate data not presented on borelogs or provided in Remedial Investigation/Feasibility Study documentation.

Footnote:

(1) Monitoring well abandoned in April 2018 (MW810 abandonded in July 2018).

(2) Based on the depth to bedrock from nested monitoring well.

(3) Sites L2 and L14 measured only during Annual round.

TABLE 2-4

Surface Water Elevations
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

Site	Surface Water Location	April Surface Water Elevation		October Surface Water Elevation	
		Date	Feet (MSL)	Date	Feet (MSL)
L1	SW550	4/9/2018	603.90	10/1/2018	603.53
L2[(1)]	SW555	**NM**	**NM**	10/4/2018	600.03
L3	SW777	4/18/2018	588.73	10/6/2018	588.72
M1	SW709	4/19/2017	532.48	10/3/2018	532.10

Notes:
MSL = Mean sea level.
NM = Not measured.

Footnotes:
(1) Site L2 measured only during Annual round.

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TABLE 3-1

Summary of Analytical Results - Explosives
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	**1,3-DNB**		**2,4-DNT**		**2,6-DNT**		**2-A-4,6-DNT**		**4-A-2,6-DNT**		**HMX**		**NB**		**2-NT**		**3-NT**		**4-NT**		**RDX**		**Tetryl**		**1,3,5-TNB**		**2,4,6-TNT**	
		Units	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
		Project Action Limit[1]	10		0.42		0.42		NS		NS		5100		51		5100		NS		NS		2.6		200		5.1		9.5	
		Surface Water RG[2]	4		330		150		NS		NS		260		8000		62		NS		NS		500		NS		15		75	
Site	**Monitoring Well ID**	**Date**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**
L1	***In-Plume***																													
	MW131	4/10/2018	<20		<6		<6		43		52		<20	/ UJ	<20		<20		<20		<20		<20		<20		**2900**		**4000**	
		10/1/2018	<5		<1.5		**1.3**	J /	23		23		<5		<5		<5		<5		<5		<5		<5		**1400**		**920**	
	MW173	4/10/2018	<1		<0.3		<0.3		3.1		3.9		0.64	J / J	<1		<1		<1		<1		**6.3**		<1		0.38	J /	8.2	
		10/1/2018	<1		<0.3		<0.3		2.9		3.7		0.68	J / J	<1		<1		<1		<1		**4.9**		<1		<1		5	
	WES1	4/10/2018	<1		<0.3		<0.3		8.6		12		<1	/ UJ	<1		<1		<1		<1		<1		<1		**54**		**46**	/ J
		10/1/2018	<1		0.25	J / J	0.33	/ J	14		17		<1		<1		<1		<1		<1		<1		<1		**26**		**41**	
	Early Warning																													
	MW174	4/10/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		10/1/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
	WES3	4/10/2018	<1		<0.3		<0.3		0.41	J /	0.67	J /	<1	/ UJ	<1		<1		<1		<1		0.35	J / J	<1		<1		0.92	J /
		10/1/2018	<1		<0.3		<0.3		0.62	J /	0.87	J /	<1		<1		<1		<1		<1		0.4	J / J	<1		<1		0.87	J /
	Compliance																													
	SW550	4/9/2018	<1.3		<0.4		<0.4		<1.3		<1.3		<1.3	/ UJ	<1.3		<1.3		<1.3		<1.3		<1.3		<1.3	/ UJ	<1.3		<1.3	
		10/1/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
L2[3]	***In-Plume***																													
	MW404	10/4/2018	<1		<0.3		<0.3		<1		<1		14		<1		<1		<1		<1		**28**		<1		<1		<1	
		10/4/2018 (DUP)	<1		<0.3		<0.3		<1		<1		14		<1		<1		<1		<1		**28**		<1		<1		<1	
	Early Warning																													
	MW620	10/4/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
	Compliance																													
	MW621	10/4/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
	SW555	10/4/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
L3	***In-Plume***																													
	MW412	4/18/2018	<1		<0.3		<0.3		0.36	J /	<1		15	/ J	<1		<1		<1		<1		**43**		<1		<1		<1	
		4/18/2018 (DUP)	<1		<0.3		<0.3		0.41	J /	0.67	J /	14	/ J	<1		<1		<1		<1		**44**		<1		<1		<1	
		10/6/2018	<1		<0.3		<0.3		0.87	J /	1		16		<1		<1		<1		<1		**61**		<1		<1		<1	
		10/6/2018 (DUP)	<1		<0.3		<0.3		0.85	J /	1.2		17		<1		<1		<1		<1		**62**		<1		<1		<1	
	Early Warning																													
	MW630	4/18/2018	<1		<0.3		<0.3		<1		<1		1.8	/ J	<1		<1		<1		<1		**3.3**		<1		<1		<1	
		10/6/2018	<1		<0.3		<0.3		<1		<1		1.4		<1		<1		<1		<1		2.5		<1		<1		<1	
	MW631	4/18/2018	<1		<0.3		<0.3		<1		<1		<1	/ UJ	<1		<1		<1		<1		<1		<1		<1		<1	
		10/6/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
	MW633	4/18/2018	<1		<0.3		<0.3		<1		<1		0.47	J / J	<1		<1		<1		<1		1.1	/ J	<1		<1		<1	
		10/6/2018	<1		<0.3		<0.3		<1		<1		1.4		<1		<1		<1		<1		**3.9**		<1		<1		<1	
	Compliance																													
	SW777	4/18/2018	<1.4		<0.43		<0.43		<1.4		<1.4		<1.4	/ UJ	<1.4		<1.4		<1.4		<1.4		<1.4		<1.4		<1.4		<1.4	
		10/6/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
L14[3]	***In-Plume***																													
	MW511	10/1/2018	<1		<0.3		<0.3		<1		<1		8.3		<1		<1		<1		<1		**47**		<1		<1		<1	
	MW512	10/1/2018	<1		<0.3		<0.3		1.1		1.5		31		<1		<1		<1		<1		**76**		<1		<1		<1	
	Early Warning																													
	H7	10/1/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		0.47	J / J	<1		<1		<1	
M6	***In-Plume***																													
	MW212R	4/15/2018	<1		**11**		**5.9**		2.5		1.5		<1	/ UJ	<1		54		7.9		11		<1		<1		<1		1.8	
		4/15/2018 (DUP)	<1		**11**		**5.8**		2.5		1.5		<1	/ UJ	<1		55		7.8		11		<1		<1		<1		1.8	
		10/8/2018	<50		**920**	/ J	**250**	/ J	16	J / J	<50		<50		<50		4000		360	/ J	2500	/ J	<50		<50		<50		**130**	
		10/8/2018 (DUP)	<50		**1200**	/ J	**330**	/ J	22	J /	<50		<50		<50		5100		500	/ J	3400	/ J	<50		<50		<50		**180**	
	MW652	4/17/2018	<20		**1300**		**320**		40		<20		<20	/ UJ	<20		**5600**		510		2700		<20		<20		<20		**170**	
		10/4/2018	<50		**1100**		**350**		42	J /	<50		<50		<50		4700		440		2800		<50		<50		<50		**150**	
	Early Warning																													
	MW123R	4/15/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		10/4/2018	<1		<0.3		**0.47**	/ J	<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
	MW162R	4/15/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		10/4/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
	MW313	4/17/2018	<1		<0.3		<0.3		<1		<1		<1	/ UJ	<1		<1		<1		<1		<1		<1		<1		<1	
		10/4/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
	MW318	4/17/2018	<1		<0.3		<0.3		<1		<1		<1	/ UJ	3.3	/ J	<1		0.51	J / J	<1		<1		<1		<1		<1	
		10/4/2018	<1		<0.3		<0.3		<1		<1		<1		<1		0.41	J / J	<1		<1		<1		<1		<1		<1	
	MW319	4/17/2018	<1		<0.3		<0.3		<1		<1		<1	/ UJ	2.4	/ J	<1		0.35	J / J	<1		<1		<1		<1		<1	
		10/4/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
	MW654	4/17/2018	<1		**1.6**		**1.5**	/ J	18		25		<1	/ UJ	<1		<1		<1		<1		<1		<1		<1		3.4	
		10/4/2018	<1		**9.1**		**9.1**		7		9.9		<1		<1		7.9		1.3		4.8		<1		0.51	J /	<1		<1	

TABLE 3-1

Summary of Analytical Results - Explosives
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	**1,3-DNB**		**2,4-DNT**		**2,6-DNT**		**2-A-4,6-DNT**		**4-A-2,6-DNT**		**HMX**		**NB**		**2-NT**		**3-NT**		**4-NT**		**RDX**		**Tetryl**		**1,3,5-TNB**		**2,4,6-TNT**	
		Units	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
		Project Action Limit[1]	10		0.42		0.42		NS		NS		5100		51		5100		NS		NS		2.6		200		5.1		9.5	
		Surface Water RG[2]	4		330		150		NS		NS		260		8000		62		NS		NS		500		NS		15		75	
Site	**Monitoring Well ID**	**Date**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**
(Other Areas)	***Compliance***																													
	MW117	4/13/2018	<1		<0.3		<0.3		<1		<1		<1	/ UJ	<1		<1		<1		<1		<1		<1		<1		<1	
		10/10/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
	MW118	4/13/2018	<1		<0.3		<0.3		<1		<1		<1	/ UJ	<1		<1		<1		<1		<1		<1		<1		<1	
		10/10/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
	MW119	4/13/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		10/10/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
M13	***Upgradient***																													
	MW806	4/16/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		10/9/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
	MW807	4/16/2018	<1		<0.3		<0.3		<1		<1		<1	/ UJ	<1		<1		<1		<1		<1		<1		<1		<1	
		10/9/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
	Downgradient																													
	MW126R	4/16/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		10/9/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		10/9/2018 (DUP)	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
	MW362	4/16/2018	<1		**4**	/ J	**0.45**	/ J	1.2		1		<1	/ UJ	<1		<1		<1		<1		<1		<1		<1		<1	
		4/16/2018 (DUP)	<1		**5.6**	/ J	**0.48**		1.3		0.96	J /	<1	/ UJ	<1		<1		<1		<1		<1		<1		<1		<1	
		10/9/2018	<1		**6.7**		**0.52**		1.4		1.1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		10/9/2018 (DUP)	<1		**6.9**		**0.55**		1.4		1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
	MW808	4/16/2018	<1		<0.3		<0.3		<1		<1		<1	/ UJ	<1		<1		<1		<1		<1		<1		<1		<1	
		10/9/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
	MW809	4/16/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		10/9/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
	MW811	4/16/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		10/9/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
M11[3]	***Upgradient***																													
	MW802	10/2/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
	MW803	10/2/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
	Downgradient																													
	MW333	10/2/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
	MW334	10/2/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
	MW335	10/2/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
	MW336	10/2/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
	MW804	10/2/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
	MW805	10/2/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	

Notes:

µg/L = Micrograms per liter.
NS = No standard.
RG = Remedial Goal.
ID = Identification.
LF/VF = Lab flag/validation flag.
< = Result shows laboratory Method Reporting Limit for non-detected results.
UJ = Not detected, estimated detection limit.
J = Estimated concentration.
DUP = Duplicate.
Bolded result indicates Project Action Limit (RG) exceedance.
Sites L2, L14, and M11 sampled only during Annual round.

1,3-DNB = 1,3-Dinitrobenzene.
2,4-DNT = 2,4-Dinitrotoluene.
2,6-DNT = 2,6-Dinitrotoluene.
2-A-4,6-DNT = 2-amino-4,6-Dinitrotoluene.
4-A-2,6-DNT = 4-amino-2,6-Dinitrotoluene.
HMX = High melting-point explosive.
NB = Nitrobenzene.
2-NT = 2-Nitrotoluene.
3-NT = 3-Nitrotoluene.
4-NT = 4-Nitrotoluene.
RDX = Royal Demolition Explosive.

1,3,5-TNB = 1,3,5-Trinitrobenzene.
TNT = 2,4,6-Trinitrotoluene.

Footnotes:

(1) Project Action Limits are the Remedial Goals as specified in Table 6-2 of the 1998 Record of Decision. Where no RG is presented in the 1998 Record of Decision, the Project Action Limit is obtained from Illinois Environmental Protection Agency Class II groundwater standards.
(2) The surface water Project Action Limits are obtained from Table 10-1 in the 1998 Record of Decision.
(3) Sites L2, L14, and M11 sampled only during the annual round.

TABLE 3-2

Summary of Analytical Results - Target Analyte List Metals
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Analyte	Aluminum		Antimony		Arsenic		Barium		Beryllium		Cadmium		Chromium		Cobalt		Copper		Iron		Lead		Manganese		Mercury		Nickel		Selenium		Silver		Thallium		Vanadium		Zinc	
		Units	mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
		Project Action Limit[1]	100		0.024		0.2		NS		NS		0.05		1.0		NS		NS		5.0		0.1		10		NS		NS		NS		0.511		NS		NS		10	
Site	**Monitoring Well ID**	**Date**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**
M13	***Upgradient***																																							
	MW806	4/16/2018	<0.4		<0.02		0.0026	J /	0.092		<0.005		<0.005		<0.01		<0.025		<0.01		<0.1		<0.01		<0.015		<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
		10/9/2018	<0.8		<0.04		<0.03		0.11		<0.01		0.0014	J /	<0.02		<0.05		<0.02		1		<0.02		0.029	J /	<0.0002		<0.08		<0.04		<0.02		<0.1		<0.1		<0.04	
	MW807	4/16/2018	<0.4		<0.02		<0.015		0.11		<0.005		0.0006	J /	<0.01		<0.025		<0.01		0.84		<0.01		0.12		<0.0002		0.0053	J /	<0.02		<0.01		<0.05		<0.05		<0.02	
		10/9/2018	<0.4		<0.02		<0.015		0.093		<0.005		0.0008	J /	<0.01		<0.025		<0.01		0.46		<0.01		0.11		<0.0002		<0.04		<0.02		<0.01		<0.05		0.0094	J /	<0.02	
	Downgradient																																							
	MW126R	4/16/2018	<0.4		<0.02		<0.015		0.15		<0.005		<0.005		<0.01		<0.025		<0.01		<0.1		<0.01		0.0022	J /	<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
		10/9/2018	<0.4		<0.02		0.0036	J /	0.079		<0.005		<0.005		<0.01		<0.025		<0.01		<0.1		<0.01		0.02		<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
		10/9/2018 (DUP)	<0.4		<0.02		0.0046	J /	0.082		<0.005		<0.005		<0.01		<0.025		<0.01		<0.1		<0.01		0.02		<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
	MW362	4/16/2018	<0.4		<0.02		0.0036	J /	0.058		<0.005		<0.005		<0.01		<0.025		<0.01		<0.1		<0.01		0.2		<0.0002		0.0081	J /	<0.02		<0.01		<0.05		<0.05		<0.02	
		4/16/2018 (DUP)	<0.4		<0.02		0.0038	J /	0.059		<0.005		0.0006	J /	<0.01		<0.025		<0.01		<0.1		<0.01		0.2		<0.0002		0.0094	J /	<0.02		<0.01		0.006	J /	<0.05		<0.02	
		10/9/2018	<0.4		<0.02		0.0048	J /	0.061		<0.005		0.0007	J /	<0.01		<0.025		<0.01		<0.1		<0.01		0.2		<0.0002		<0.04		<0.02		<0.01		<0.05		0.0089	J /	<0.02	
		10/9/2018 (DUP)	<0.4		<0.02		0.0046	J /	0.057		<0.005		0.0009	J /	<0.01		<0.025		<0.01		<0.1		<0.01		0.19		<0.0002		<0.04		<0.02		<0.01		<0.05		0.0086	J /	<0.02	
	MW808	4/16/2018	<0.4		<0.02		<0.015		0.067		<0.005		<0.005		<0.01		<0.025		<0.01		<0.1		<0.01		0.24		<0.0002		0.0073	J /	<0.02		<0.01		<0.05		<0.05		<0.02	
		10/9/2018	<0.4		<0.02		0.0027	J /	0.085		<0.005		0.0009	J /	<0.01		<0.025		0.0031	J /	<0.1		<0.01		0.85		<0.0002		0.013	J /	<0.02		<0.01		<0.05		<0.05		<0.02	
	MW809	4/16/2018	<0.4		<0.02		<0.015		0.03		<0.005		<0.005		<0.01		<0.025		<0.01		<0.1		<0.01		0.0028	J /	<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
		10/9/2018	<0.4		<0.02		<0.015		0.028		<0.005		<0.005		<0.01		<0.025		<0.01		<0.1		<0.01		<0.015		<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
	MW811	4/16/2018	<0.4		<0.02		0.0048	J /	0.064		<0.005		<0.005		<0.01		<0.025		<0.01		1.1		<0.01		0.055		<0.0002		0.0089	J /	<0.02		<0.01		<0.05		<0.05		<0.02	
		10/9/2018	<0.4		<0.02		0.0046	J /	0.066		<0.005		<0.005		<0.01		<0.025		<0.01		1.5		<0.01		0.045		<0.0002		<0.04		<0.02		<0.01		<0.05		0.01	J /	<0.02	
M11[2]	***Upgradient***																																							
	MW802	10/2/2018	<0.4		<0.02		<0.015		0.064		<0.005		0.0008	J /	<0.01		<0.025		<0.01		2	/ J	<0.01		1.2		<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
	MW803	10/2/2018	<0.4		<0.02		<0.015		0.027		<0.005		<0.005		<0.01		<0.025		<0.01		<0.1		<0.01		<0.015		<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
	Downgradient																																							
	MW333	10/2/2018	<0.4		<0.02		<0.015		0.073		<0.005		0.0007	J /	<0.01		<0.025		<0.01		<0.1		<0.01		<0.015		<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
	MW334	10/2/2018	<0.4		<0.02		<0.015		0.052		<0.005		0.0009	J /	<0.01		<0.025		<0.01		0.72		<0.01		0.81		<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
	MW335	10/2/2018	<0.4		<0.02		<0.015		0.088		<0.005		0.0007	J /	<0.01		<0.025		<0.01		1.4		<0.01		1.3		<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
	MW336	10/2/2018	<0.4		<0.02		<0.015		0.028		<0.005		0.0006	J /	<0.01		0.0051	J /	<0.01		0.14		<0.01		0.36		<0.0002		0.0053	J /	<0.02		<0.01		<0.05		<0.05		<0.02	
	MW804	10/2/2018	<0.4		<0.02		<0.015		0.044		<0.005		0.0008	J /	<0.01		<0.025		<0.01		0.36		<0.01		0.13		<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
	MW805	10/2/2018	<0.4		<0.02		<0.015		0.029		<0.005		0.0006	J /	<0.01		<0.025		<0.01		<0.1		<0.01		<0.015		<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	

Notes:

An abbreviated list of analytes is used for reporting based on historically detected and reported compounds.

mg/L = Milligrams per liter.

NS = No standard.

ID = Identification

LF/VF = Lab flag/validation flag.

< = Result shows laboratory Method Reporting Limit for non-detected results.

J = Estimated concentration.

B = Blank contamination.

DUP = Duplicate.

U = Not detected.

Bolded result indicates Project Action Limit (RG) exceedance.

Site M11 is sampled only during Annual round.

Footnotes:

(1) Project Action Limits are the Remedial Goals (RGs) as specified in Table 6-2 of the 1998 Record of Decision. Where no RG is presented in the 1998 Record of Decision, the Project Action Limit is obtained from Illinois Environmental Protection Agency Class II groundwater standards.

(2) Site M11 only sampled during the Annual round.

TABLE 3-3

Summary of Analytical Results - Indicator Parameters
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	Nitrate		Sulfate	
		Units	mg/L		mg/L	
		Project Action Limit[1]	100		400	
		Surface Water RG[2]	NS		500	
Site	**Monitoring Well ID**	**Date**	**Result**	**LF/VF**	**Result**	**LF/VF**
M1	***In-Plume***					
	MW107	4/13/2018	NA		**2,700**	
		10/2/2018	NA		**9,800**	
	MW231	4/13/2018	NA		**32,000**	
		4/13/2018 (DUP)	NA		**33,000**	
		10/3/2018	NA		**33,000**	
		10/3/2018 (DUP)	NA		**33,000**	
	MW640	4/13/2018	NA		**3,900**	
		10/2/2018	NA		**3,800**	
	MW641	4/10/2018	NA		250	
		10/3/2018	NA		**470**	
	MW642	4/10/2018	NA		280	
		10/3/2018	NA		290	
	Early Warning					
	MW643	4/13/2018	NA		78	
		10/3/2018	NA		38	
	MW644	4/13/2018	NA		130	
		10/3/2018	NA		140	
	Compliance					
	MW645	4/10/2018	NA		60	
		10/3/2018	NA		78	
	MW646	4/10/2018	NA		100	
		10/3/2018	NA		110	
	MW649	4/13/2018	NA		47	
		10/3/2018	NA		110	
	SW709	4/13/2018	NA		55	
		10/3/2018	NA		65	
M8	***In-Plume***					
	MW330	4/10/2018	NA		**440**	
		10/8/2018	NA		**460**	
M13	***Upgradient***					
	MW806	4/16/2018	0.29		69	
		10/9/2018	<0.02		52	
	MW807	4/16/2018	<0.02		200	
		10/9/2018	<0.02		250	

TABLE 3-3

Summary of Analytical Results - Indicator Parameters
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	Nitrate		Sulfate	
		Units	mg/L		mg/L	
		Project Action Limit(1)	100		400	
		Surface Water RG(2)	NS		500	
Site	**Monitoring Well ID**	**Date**	**Result**	**LF/VF**	**Result**	**LF/VF**
M13	***Downgradient***					
	MW126R	4/16/2018	1.4		210	
		10/9/2018	0.02		99	
		10/9/2018 (DUP)	<0.02		98	
	MW362	4/16/2018	0.1	/ J	250	
		4/16/2018 (DUP)	0.023	/ J	250	
		10/9/2018	<0.02		270	
		10/9/2018 (DUP)	<0.02		240	
	MW808	4/16/2018	16	/ J	140	
		10/9/2018	0.53		220	
	MW809	4/16/2018	0.067		6.8	
		10/9/2018	0.2		9.5	
	MW811	4/16/2018	0.013	J /	130	
		10/9/2018	0.038		190	
M11(3)	***Upgradient***					
	MW802	10/2/2018	<0.02		130	
	MW803	10/2/2018	0.77		81	
	Downgradient					
	MW333	10/2/2018	0.34		65	
	MW334	10/2/2018	<0.02		160	
	MW335	10/2/2018	<0.02		340	
	MW336	10/2/2018	<0.02		350	
	MW804	10/2/2018	<0.02		300	
	MW805	10/2/2018	<0.02		350	

Notes:

mg/L = Milligrams per liter.

RG = Remedial Goal.

NS = No standard.

ID = Identification.

LF/VF = Lab flag/validation flag.

NA = Not analyzed.

DUP = Duplicate.

< = Result shows laboratory Method Reporting Limit for non-detected results.

J = Estimated concentration.

Bolded result indicates Project Action Limit (RG) exceedance.

Footnotes:

(1) Project Action Limits are the Remedial Goals as specified in Table 6-2 of the 1998 Record of Decision. Where no RG is presented in the 1998 Record of Decision, the Project Action Limit is obtained from Illinois Environmental Protection Agency Class II groundwater standards.

(2) The surface water Project Action Limits are obtained from Table 10-1 in the 1998 Record of Decision.

(3) Site M11 only sampled during the annual round.

TABLE 3-4

Summary of Analytical Results - Volatile Organic Compounds
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	Acetone		Benzene		Carbon disulfide		Chlorobenzene		Chloromethane		1,1-DCA		1,2-DCA		cis-1,2-DCE		Ethyl Benzene		MethCl		MEK		Naphthalene		PCE		Toluene		1,1,1-TCA		TCE		VC		Xylenes (total)	
		Units	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
		Project Action Limit[1]	NS		25		NS		500		NS		3500		25		200		1,000		NS		NS		NS		25		2,500		1,000		25		25		10,000	
Site	**Monitoring Well ID**	**Date**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**
M13	***Upgradient***																																					
	MW806	4/16/2018	<10	/ UJ	<1		<1		<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
		10/9/2018	<10		<1		<1		<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
	MW807	4/16/2018	<10	/ UJ	<1		<1		<1		<1		1.4		<1		1.2		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
		10/9/2018	<10		<1		<1		<1		<1		1.4		<1		1.1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
	Downgradient																																					
	MW126R	4/16/2018	<10	/ UJ	<1		<1		<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
		10/9/2018	<10		<1		<1		<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
		10/9/2018 (DUP)	<10		<1		<1		<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
	MW362	4/16/2018	<10	/ UJ	<1		<1		<1		<1		0.64	J /	<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
		4/16/2018 (DUP)	<10	/ UJ	<1		<1		<1		<1		0.64	J /	<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
		10/9/2018	<10		<1		<1		<1		<1		0.7	J /	<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
		10/9/2018 (DUP)	<10		<1		<1		<1		<1		0.78	J /	<1		0.4	J /	<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
	MW808	4/16/2018	<10	/ UJ	<1		<1		<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
		10/9/2018	<10		<1		<1		<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
	MW809	4/16/2018	<10	/ UJ	<1		<1		<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
		10/9/2018	<10		<1		<1		<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
	MW811	4/16/2018	<10	/ UJ	<1		<1		<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
		10/9/2018	<10	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<10	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ
M11[2]	***Upgradient***																																					
	MW802	10/2/2018	<10	/ UJ	<1		<1		<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
	MW803	10/2/2018	<10	/ UJ	<1		<1		<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
	Downgradient																																					
	MW333	10/2/2018	<10	/ UJ	<1		<1		<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
	MW334	10/2/2018	<10	/ UJ	<1		<1		<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
	MW335	10/2/2018	<10	/ UJ	<1		<1		<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
	MW336	10/2/2018	<10	/ UJ	<1		<1		<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
	MW804	10/2/2018	<10	/ UJ	<1		<1		<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
	MW805	10/2/2018	<10	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<10	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ

Notes:

An abbreviated list of compounds analyzed is used for reporting based on historically detected and reported compounds.
µg/L = Micrograms per liter.
NS = No standard.
ID = Identification.
LF/VF = Lab flag/validation flag.
< = Result shows laboratory method reporting limit for non-detected results.
U = Not detected
J = Estimated concentration.
DUP = Duplicate.
Bolded result indicates Project Action Limit (RG) exceedance.

1,1-DCA = 1,1-Dichloroethane.
1,2-DCA = 1,2-Dichloroethane.
cis-1,2-DCE = cis-1,2-Dichloroethene.
MethCl = Methylene chloride.
MEK = Methyl ethyl ketone (2-butanone).
PCE = Tetrachloroethene.
1,1,1-TCA = 1,1,1-Trichloroethane.
TCE = Trichloroethene.
VC = Vinyl chloride.

Footnotes:

(1) Project Action Limits are the Remedial Goals (RGs) as specified in Table 6-2 of the 1998 Record of Decision. Where no RG is presented in the 1998 Record of Decision, the Project Action Limit is obtained from Illinois Environmental Protection Agency Class II groundwater standards.
(2) Site M11 only sampled during the annual round.

TABLE 3-5

Summary of Analytical Results - Semivolatile Organic Compounds
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	2,4-DNT		2,6-DNT		NB		Phenol		Naphthalene	
		Units	µg/L		µg/L		µg/L		µg/L		µg/L	
		Project Action Limit(1)	0.42		0.42		51		NS		NS	
Site	**Monitoring Well ID**	**Date**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**
M13	***Upgradient***											
	MW806	4/16/2018	<1.6	/ UJ	<1.6		<0.8		<0.8	/ UJ	<0.8	
		10/9/2018	<1.6		<1.6		<0.8		<0.8	/ UJ	<0.8	
	MW807	4/16/2018	<1.6	/ UJ	<1.6		<0.8		<0.8	/ UJ	<0.8	
		10/9/2018	<1.6		<1.6		<0.8		<0.8	/ UJ	<0.8	
	Downgradient											
	MW126R	4/16/2018	<1.6	/ UJ	<1.6		<0.8		<0.8	/ UJ	<0.8	
		10/9/2018	<1.6		<1.6		<0.8		<0.8	/ UJ	<0.8	
		10/9/2018 (DUP)	<1.6		<1.6		<0.8		<0.8	/ UJ	<0.8	
	MW362	4/16/2018	**2.6**	/ J	<1.6		<0.8		<0.8	/ UJ	<0.8	
		4/16/2018 (DUP)	**3**	/ J	<1.6		<0.8		<0.8	/ UJ	<0.8	
		10/9/2018	**3.2**		<1.6		<0.8		<0.8	/ UJ	<0.8	
		10/9/2018 (DUP)	**3.6**		<1.6		<0.8		<0.8	/ UJ	<0.8	
	Downgradient											
	MW808	4/16/2018	<1.6	/ UJ	<1.6		<0.8		<0.8	/ UJ	<0.8	
		10/9/2018	<1.6		<1.6		<0.8		<0.8	/ UJ	<0.8	
	MW809	4/16/2018	<1.6	/ UJ	<1.6		<0.8		<0.8	/ UJ	<0.8	
		10/9/2018	<1.6		<1.6		<0.8		<0.8	/ UJ	<0.8	
	MW811	4/16/2018	<1.6	/ UJ	<1.6		<0.8		<0.8	/ UJ	<0.8	
		10/9/2018	<1.6		<1.6		<0.8		<0.8	/ UJ	<0.8	
M11(2)	***Upgradient***											
	MW802	10/2/2018	<1.6		<1.6		<0.8		<0.8		<0.8	
	MW803	10/2/2018	<1.6		<1.6		<0.8		<0.8		<0.8	
	Downgradient											
	MW333	10/2/2018	<1.6		<1.6		<0.8		<0.8		<0.8	
	MW334	10/2/2018	<1.6		<1.6		<0.8		<0.8		<0.8	
	MW335	10/2/2018	<1.6		<1.6		<0.8		<0.8	/ UJ	<0.8	
	MW336	10/2/2018	<1.6		<1.6		<0.8		<0.8		<0.8	
	MW804	10/2/2018	<1.6		<1.6		<0.8		<0.8		<0.8	
	MW805	10/2/2018	<1.6		<1.6		<0.8		<0.8		<0.8	

Notes:

An abbreviated list of compounds analyzed is used for reporting based on historically detected and reported compounds.

2,4-DNT = 2,4-Dinitrotoluene.

2,6-DNT = 2,6-Dinitrotoluene.

NB = Nitrobenzene.

µg/L = Micrograms per liter.

NS = No standard.

ID = Identification.

LF/VF = Lab flag/validation flag.

< = Result shows laboratory method reporting limit for non-detected results.

UJ = Estimated detection limit.

DUP = Duplicate.

Bolded result indicates Project Action Limit (RG) exceedance.

See Table 3-1 for 2,4-DNT and 2,6-DNT results where the semivolatile organic compound reporting limit exceeded the RG.

Footnote:

(1) Project Action Limits are the Remedial Goals (RGs) as specified in Table 6-2 of the 1998 Record of Decision. Where no RG is presented in the 1998 Record of Decision, the Project Action Limit is obtained from Illinois Environmental Protection Agency Class II groundwater standards.

(2) Site M11 only sampled during the annual round.

TABLE 3-6

Summary of Groundwater Trends: Estimated Clean-Up Times
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

Site	Monitoring Well	Compound	Initial [1] Concentration (µg/L-mg/L)	Date of Initial Concentration	Final Concentration (µg/L) (Remediation Goal)	Record of Decision Estimated Clean-Up Time for Site: Years/Date	R^2 Value[2]	Estimated Clean-Up Time (years)	Estimated Clean-Up Date (year)	Source Removal Completion Date
L1	MW131	2,4,6-TNT	11,000	2009	9.5	340/2338	**0.0073**	*	*	2006
		1,3,5-TNB	4,200	2007	5.1		**0.0004**	*	*	2006
	MW173	RDX	15	2007	2.6		0.1433	**13**	2031	2006
		2,4,6-TNT	20	2009	9.5		**0.0005**	*	*	2006
L2	MW404	RDX	270	2006	2.6	20/2018	0.3652	**30**	2048	2007
L3	MW412	RDX	440	2008	2.6	50/2048	0.7201	**18**	2036	2008
	MW630	RDX	13	2011	2.6		0.2365	*	*	2008
	MW633	RDX	390	2008	2.6		**0.106**	**24**	2042	2008
L14	MW511	RDX	170	2007	2.6	80/2078	0.2684	**12**	2030	2005
	MW512	RDX	400	2011	2.6		0.4091	**27**	2045	2005
M1	MW107	Sulfate	49,000	2009	400	NC	0.6114	**17**	2035	2008
	MW231	Sulfate	41,000	2010	400		0.2086	**415**	2433	2008
	MW640	Sulfate	6,800	2013	400		**0.055**	**150**	2168	2008
	MW641	Sulfate	1,300	2010	400		0.5922	**3**	2021	2008
	MW642	Sulfate	460	2010	400		0.6743	**-4**	2014	2008
M6	MW212R	2,4-DNT	17,000	2005	0.42	50/2048	**0.0415**	**84**	2102	2005
		2,6-DNT	3,500	2005	0.42		**0.0591**	**69**	2087	2005
		2-NT	81,000	2005	5,100		**0.0479**	**2**	2020	2005
		2,4,6-TNT	1,300	2013	9.5		**0.0772**	**29**	2047	2005
	MW652	2,4-DNT	10,000	2005	0.42		0.3363	**79**	2097	2005
		2,6-DNT	5,400	2005	0.42		0.4072	**52**	2070	2005
		2-NT	98,000	2005	5,100		0.4382	**7**	2025	2005
		2,4,6-TNT	3,400	2005	9.5		0.5096	**27**	2045	2005
	MW318	2,6-DNT	6.7	2004	0.42		0.3917	**6**	2023	2005
M8	MW330	Sulfate	590	2015	400		**0.0031**	*	*	2003[3]
M6	MW654	2,4-DNT	810	2015	0.42		0.2287	*	*	2005
		2,6-DNT	370	2016	0.42		0.2869	*	*	2005
		2,4,6-TNT	53	2016	9.5		0.4051	*	*	2005
M13	MW362	2,4-DNT	7.6	2015	0.42	NC	0.3086	*	*	2008
M11	MW335	Sulfate	1,300	2008	400	NC	0.3466	**1**	2019	2008
	MW336	Sulfate	710	2013	400		0.128	**21**	2039	2008
	MW805	Sulfate	590	2008	400		0.7841	**1**	2019	2008

Notes:

Indicates that R^2 value is less than 0.1 and/or clean-up time could not be calculated.

Bolded value represents the estimated cleanup time in years for the associated compound.

Estimated clean-up times are approximate and based on constant contamination reduction rates for a specific compound at a specific point within the aquifer.

* = Trend curve indicates increasing concentrations. An estimated clean-up time or corresponding date could not be calculated.

µg/L-mg/L = Micrograms per liter for explosives, and milligrams per liter for sulfate.

NC = Not calculated.

2,4,6-TNT = 2,4,6-Trinitrotoluene.

1,3,5-TNB = 1,3,5-Trinitrobenzene.

RDX = Royal Demolition Explosive.

2,4-DNT = 2,4-Dinitrotoluene.

2,6-DNT = 2,6-Dinitrotoluene.

2-NT = 2-Nitrotoluene.

Footnotes:

(1) Initial concentration is the maximum observed concentration during the timeframe included.

(2) The R^2 value represents an indicator of how well the equation resulting from the regression analysis explains the relationship among the variables. Shaded analysis results with and R^2 value less than 0.1 are unreliable.

(3) First data point used from October 2003. Remedial action assumed completed in 2003.

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J:\2028A USACE JOAAP\03.00 Deliverables\03.06 Reports 2018\03.06.03 Annual Report\03.06.03.03 FINAL Annual Report\Parts\Tables\Table 3-6 2018 Annual Calculated Clean-Up Times.xlsx

TABLE 3-7

Vertical Gradient Calculations
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

Site ID	Well ID	Ground Elevation (ft MSL)	Depth (ft) to top of screen (from ground)	Depth (ft) to Bottom of Screen (from ground)	Top of Screen Elevation (ft MSL)	Bottom of Screen Elevation	Screen Length (feet)	Elevation of Screen Midpoint (ft MSL)	Groundwater Elevation 4/18 (ft MSL)	Vertical Gradient 4/18 (ft/ft)	Groundwater Elevation 10/18 (ft MSL)	Vertical Gradient 10/18 (ft/ft)
L1	**Overburden to Bedrock**											
	MW178	640.39	27.3	46.5	613.09	593.89	19.2	603.49	619.06	-0.2868	607.65	**DRY**
	MW176	643.49	4.8	20.8	638.69	622.69	16.0	630.69	625.32		**DRY**	
	MW172	613.19	14.5	34.5	598.69	578.69	20.0	588.69	605.13	-0.1109	605.04	0.0055
	MW173	612.56	2.8	11.8	609.76	600.76	9.0	605.26	607.18		604.95	
	MW177	613.84	11.8	31.0	602.04	582.84	19.2	592.44	608.54	-0.0634	605.68	-0.1203
	MW171	615.03	2.9	7.9	612.13	607.13	5.0	609.63	609.63		607.49	
	MW401	610.2	28.5	43.5	581.70	566.70	15.0	574.20	605.26	-0.0067	604.40	0.0339
	MW610	609.62	4.0	14.0	605.62	595.62	10.0	600.62	605.47		603.41	
L2[1]	**Overburden to Bedrock**											
	MW621	602.41	22.0	32.0	580.41	585.40	10.0	575.41	**NM**	**NM**	599.91	0.0240
	MW620	602.41	7.0	17.0	595.41	570.40	10.0	590.41	**NM**		599.55	
L3	**Bedrock to Bedrock**											
	MW631	592.23	16.0	26.0	576.23	566.23	10.0	571.23	591.58	0.2322	589.07	0.1087
	MW630	592.23	7.0	12.0	585.23	580.23	5.0	582.73	588.91		587.82	
L14[1]	**Overburden to Bedrock**											
	MW602	581.22	21.0	31.0	560.22	550.22	10.0	555.22	**NM**	**NM**	571.40	-0.0956
	H-7	581.45	4.0	14.0	577.45	567.45	10.0	572.45	**NM**		573.11	
	Combination to Bedrock											
	MW604	578.27	20.0	30.0	558.27	548.27	10.0	553.27	**NM**	**NM**	570.44	0.0100
	MW603	578.27	6.0	16.0	572.27	562.27	10.0	567.27	**NM**		570.27	
M1	**Overburden to Bedrock**											
	MW640	545.4	29.0	39.0	516.40	506.40	10.0	511.40	544.37	0.0425	541.38	0.0354
	MW351	545.68	9.5	19.5	536.18	526.18	10.0	531.18	543.53		540.68	
	MW642	545.08	29.0	39.0	516.08	506.08	10.0	511.08	541.86	-0.0236	538.88	-0.0255
	MW641	545.08	7.0	17.0	538.08	528.08	10.0	533.08	542.38		539.44	
	MW644	540.23	10.8	20.4	529.43	519.83	9.6	524.63	534.33	0.0275	532.38	0.0361
	MW643	540.03	4.3	7.2	535.73	532.83	2.9	534.28	534.07		532.11	
	MW646	541.48	12.3	21.9	529.18	519.58	9.6	524.38	533.13	0.0057	531.37	0.0417
	MW645	541.47	7.5	11.5	533.97	529.97	4.0	531.97	533.08		531.09	
M4	**Combination to Bedrock**											
	MW158	531.58	9.0	29.5	522.58	502.08	20.5	512.33	532.25	-0.0314	530.60	-0.1108
	MW157	531.37	3.7	10.2	527.67	521.17	6.5	524.42	532.63		531.94	
M6	**Overburden to Bedrock**											
	MW320R	554.6	30.5	45.5	524.10	509.10	15.0	516.60	545.75	0.0076	544.98	0.0053
	MW166R	555.6	10.0	20.0	545.60	535.60	10.0	540.60	545.53		544.83	
	MW651	563.83	36.0	46.0	527.83	517.83	10.0	522.83	549.05	-0.3121	548.59	-0.2942
	MW650	563.83	12.0	22.0	551.83	541.83	10.0	546.83	556.54		555.65	
	MW653	561.93	36.0	46.0	525.93	515.93	10.0	520.93	547.20	-0.3128	546.71	-0.2572
	MW652	561.93	11.0	21.0	550.93	540.93	10.0	545.93	555.02		553.14	
	MW215R	565.30	38.5	53.5	526.80	511.80	15.0	519.30	547.03	-0.1992	546.35	-0.2191
	MW212R	565.30	9.5	19.5	555.80	545.80	10.0	550.80	553.93		553.94	
	MW213R	564.30	38.0	53.0	526.30	511.30	15.0	518.80	547.43	-0.2521	546.90	-0.0567
	MW210R	564.30	10.7	20.0	553.60	544.30	9.3	548.95	555.03		548.59	
	MW310R	563.00	44.5	59.5	518.50	503.50	15.0	511.00	543.69	-0.3522	543.32	-0.3655
	MW309	563.43	12.7	27.7	550.73	535.73	15.0	543.23	555.04		555.10	
	MW308	561.38	50.5	65.5	510.88	495.88	15.0	503.38	542.10	-0.0451	541.75	-0.0521
	MW307	561.45	17.0	27.0	544.45	534.45	10.0	539.45	543.93		543.86	
	Combination to Bedrock											
	MW123R	534.90	15.0	30.0	519.90	504.90	15.0	512.40	532.57	-0.1464	532.18	-0.1885
	MW162R	537.70	4.5	9.5	533.20	528.20	5.0	530.70	535.25		535.63	

TABLE 3-7

Vertical Gradient Calculations
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

Site ID	Well ID	Ground Elevation (ft MSL)	Depth (ft) to top of screen (from ground)	Depth (ft) to Bottom of Screen (from ground)	Top of Screen Elevation (ft MSL)	Bottom of Screen Elevation	Screen Length (feet)	Elevation of Screen Midpoint (ft MSL)	Groundwater Elevation 4/18 (ft MSL)	Vertical Gradient 4/18 (ft/ft)	Groundwater Elevation 10/18 (ft MSL)	Vertical Gradient 10/18 (ft/ft)
M6	**Bedrock to Bedrock**											
	MW312	545.96	40.0	55.0	505.96	490.96	15.0	498.46	548.20	0.0059	547.73	-0.0076
	MW311	546.36	14.0	24.0	532.36	522.36	10.0	527.36	548.03		547.95	
	MW319	545.49	40.0	55.0	505.49	490.49	15.0	497.99	538.42	0.0082	537.12	0.0105
	MW318	545.23	11.8	21.8	533.43	523.43	10.0	528.43	538.17		536.80	
	MW313	549.20	25.0	40.0	524.20	509.20	15.0	516.70	539.94	0.0029	538.42	0.0384
	MW654	548.49	13.0	23.0	535.49	525.49	10.0	530.49	539.90		537.89	
	MW317	540.71	34.0	49.0	506.71	491.71	15.0	499.21	536.73	-0.0105	536.42	0.0159
	MW316	540.49	13.0	18.0	527.49	522.49	5.0	524.99	537.00		536.01	
	MW315	538.91	29.7	44.7	509.21	494.21	15.0	501.71	536.97	0.0031	536.83	-0.0016
	MW314	539.53	9.7	14.7	529.83	524.83	5.0	527.33	536.89		536.87	
M7	**Overburden to Overburden**											
	MW661	537.09	20.0	30.0	517.09	507.09	10.0	512.09	533.40	-0.1020	533.93	0.0000
	MW660	537.08	7.0	12.0	530.08	525.08	5.0	527.58	534.98		533.93	
	Overburden to Bedrock											
	MW217	536.90	19.5	34.5	517.40	502.40	15.0	509.90	534.55	0.0722	534.86	0.1615
	MW216	536.51	5.0	10.0	531.51	526.51	5.0	529.01	533.17		531.39	
Landfill M13	**Overburden to Bedrock**											
	MW807	563.79	35.0	45.0	528.79	518.79	10.0	523.79	549.91	-0.0792	551.04	-0.0411
	MW806	563.73	15.0	25.0	548.73	538.73	10.0	543.73	551.49		551.86	
	MW809	567.28	35.0	45.0	532.28	522.28	10.0	527.28	549.06	-0.2055	549.02	-0.1057
	MW808	567.33	15.0	25.0	552.33	542.33	10.0	547.33	553.18		551.59	
	MW364	567.69	37.0	42.0	530.69	525.69	5.0	528.19	542.21	-0.0014	541.76	-0.0015
	MW363	567.66	21.0	31.0	546.66	536.66	10.0	541.66	542.23		541.78	
	Overburden to Combination											
	MW362	562.78	28.0	33.0	534.78	529.78	5.0	532.28	549.02	0.1311	549.00	0.1555
	MW126R	563.00	11.0	21.0	552.00	542.00	10.0	547.00	547.08		546.75	
	Bedrock to Bedrock											
	MW322	542.26	34.5	49.5	507.76	492.76	15.0	500.26	535.25	-0.1585	533.46	-0.2077
	MW321	542.93	13.5	23.5	529.43	519.43	10.0	524.43	539.08		538.48	
Landfill M11[1]	**Combination to Bedrock**											
	MW803	541.56	26.5	36.5	515.06	505.06	10.0	510.06	**NM**	**NM**	540.93	0.3047
	MW802	541.62	5.0	15.0	536.62	526.62	10.0	531.62	**NM**		533.72	
	Bedrock to Bedrock											
	MW805	533.62	25.0	35.0	508.62	498.62	10.0	503.62	**NM**	**NM**	527.55	0.0200
	MW804	533.78	5.0	15.0	528.78	518.78	10.0	523.78	**NM**		527.08	

Notes:

$$\text{Vertical Gradient} = \frac{\text{Water Level in Deep Well - Water Level in Shallow Well}}{\text{ABS (Water Table Elevation - Screen Midpoint in Deep Well)}}$$

For well nests with water elevation in shallow well is above top of screen:

$$\text{Vertical Gradient} = \frac{\text{Water Level in Deep Well - Water Level in Shallow Well}}{\text{ABS (Screen Midpoint in Shallow Well - Screen Midpoint in Deep Well)}}$$

Negative vertical gradients indicate downward flow; positive indicates upward flow.
ID = Identification.
ft = Feet.
MSL = Mean sea level.
ft/ft = Feet per foot.

Footnote:
(1) Sites L2, L14, and M11 only measured during Annual round.

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TABLE 3-8

Proposed Sampling Plan - April 2019
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

Site	Well ID	Parameter
L1	***In-plume***	
	MW131	E
	MW173	E
	WES1	E
	Early Warning	
	MW174	E
	WES3	E
	Compliance	
	SW550	E
L3	***In-plume***	
	MW412	E
	Early Warning	
	MW630	E
	MW631	E
	MW633	E
	Compliance	
	SW777	E
M1	***In-plume***	
	MW107	S
	MW231	S
	MW640	S
	MW641	S
	MW642	S
	Early Warning	
	MW643	S
	MW644	S
	Compliance	
	MW645	S
	MW646	S
	MW649	S
	SW709	S
M6	***In-plume***	
	MW212R	E
	MW330(1)	S
	MW652	E
	Early Warning	
	MW123R	E
	MW162R	E
	MW313	E
	MW318	E
	MW319	E
	MW654	E
	Compliance	
	MW117	E
	MW118	E
	MW119	E

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TABLE 3-8

Proposed Sampling Plan - April 2019
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

Site	Well ID	Parameter
Landfill M13	***Upgradient***	
	MW806	E, I, M, SVOC & V
	MW807	E, I, M, SVOC & V
	Downgradient	
	MW126R	E, I, M, SVOC & V
	MW362	E, I, M, SVOC & V
	MW808	E, I, M, SVOC & V
	MW809	E, I, M, SVOC & V
	MW811	E, I, M, SVOC & V

Notes:
ID = Identification.
E = Explosives.
M = Target Analyte List metals.
S = Sulfate.
I = Indicator parameters (nitrate-N and sulfate).
SVOC = Semivolatile organic compound.
V = Volatile organic compound.
Sites L2, L14, and M11 sampled only during Annual round.

Footnote:
(1) MW330 is an in-plume well for Site M8.

TABLE 4-1

Summary of Recommendations
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

Report	Recommendation	Reasoning	Status Pending/Initiated/Completed
2009 Semi-annual			
	No recommendations regarding the monitoring program		
2009 Annual			
	Fall Sampling only at L2	Section 4.1.2.5 of LTM Plan, round with highest concentration	Initiated, Site L2 will not be sampled spring 2012
	Remove TAL metals analysis from Site L3 well MW410	No metals exceedances since sampling re-initiated in spring 2008	Initiated, metals at well MW410 were not sampled beginning fall 2011
	Remove Site M5 well MW207R from monitoring program	Section 4.1.7.4 of LTM Plan, no RG exceedances for 4 rounds	Initiated, well MW207R was not sampled beginning fall 2011
	Remove Site M3 wells MW233 and MW352 from monitoring program	Section 4.1.6.5 of LTM Plan, no RG exceedances for 4 rounds	Initiated, wells MW233 and MW352 were not sampled beginning fall 2011
	Prepare closure report for Site M3	Section 4.1.6.6 of LTM Plan, no RG exceedances for 4 rounds	Completed Final Closure Report in May 2015
2010 Semi-annual			
	Remove Site L2 well MW501 from monitoring program	Section 4.1.2.5 of LTM Plan, no RG exceedances for 4 rounds	Initiated, well MW501 was not sampled fall beginning 2011
	Fall Sampling only at L14	Section 4.1.4.5 of LTM Plan, round with highest concentration	Initiated, Site L14 will not be sampled spring 2012
	Prepare closure report for Site M5	Section 4.1.7.4 of LTM Plan, no RG exceedances for 4 rounds	Completed Final Closure Report in May 2015
	Remove cadmium analysis from Site M6 well MW123R	Section 4.1.7.4 of LTM Plan, no cadmium detections	Initiated, cadmium at well MW123R was not analyzed beginning fall 2010
2010 Annual			
	Remove Site L1 compliance well MW401 from monitoring program	No explosives detections. Site has upgradient early warning wells with no detections	Initiated, well MW401 will not be sampled beginning spring 2012
	Remove Site L1 early warning well MW172 from monitoring program	Well MW172 redundant with well MW173, upward vertical gradients	Initiated, well MW172 will not be sampled beginning spring 2012
	Change designation of Site L1 well MW173 to in-plume	Migration of contaminants	Initiated in 2011 Annual Report
	Remove Site L2 compliance well MW810 from monitoring program	No explosives detections. Site had upgradient early warning wells with no detections	Initiated, L2 is no longer sampled in spring and well MW810 will not be sampled in fall 2012
	Remove Site L3 compliance well MW632 from monitoring program	No explosives detections. Hydraulics suggest well not within migration flow path	Initiated, well MW632 will not be sampled beginning spring 2012
	Change designation of Site M1 wells MW640, MW641, and MW642 to in-plume	Migration of contaminants	Initiated in 2011 Annual Report
	Remove Site M8 in-plume well MW148RR from monitoring program	In-plume well with no sulfate exceedances since spring 2009	Initiated, well MW148RR will not be sampled beginning spring 2012
	Remove Site M13 wells AEHA14R and AEHA15 from monitoring program and abandon	Problematic wells	Initiated, wells AEHA14R and AEHA15 will not be sampled beginning spring 2012
2011 Semi-annual			
	No new recommendations		
2011 Annual			
	At Site L3/Landfill L3 sample SW004 in spring only	Upstream sample SW555 provides data for fall rounds	Initiated, SW004 will no longer sampled in fall when Site L2 is sampled
	Remove Site Landfill L3/Landfill L3 upgradient well MW03 from monitoring program	No RG exceedances at Site L3 in-plume well MW410	Initiated, well MW03 will not be sampled beginning spring 2012
	Remove Site L14 in-plume well MW508 from monitoring program	No RG exceedances	Initiated, well MW508 will not be sampled beginning spring 2012
	Remove Site L14 compliance wells MW603 and MW604 from monitoring program	Redundant, no RG exceedances in early warning well H7	Initiated, wells MW603 and MW604 will not be sampled beginning spring 2012
	Remove MFG compliance wells MW115 and MW116 from monitoring program	Redundant, no RG exceedances in upgradient Site M6 early warning wells MW123R and MW162R or Site M7 early warning well MW124R	Initiated, wells MW115 and MW116 will not be sampled beginning spring 2012
	Remove MFG compliance wells MW112 and MW113 from monitoring program	Removal of upgradient Site M5 in-plume well MW207R from monitoring program and Site M5 closure	Initiated, wells MW112 and MW113 will not be sampled beginning spring 2012
	Prepare closure report for Site M8	Removal of in-plume well MW148RR from monitoring program	Rescinded, Monitoring well MW330 remains in LTM program
	Fall Sampling only at M11	Section 4.2.2.5 of LTM Plan, stable and predictable results	Initiated spring 2013. Monitoring wells MW802, MW803, MW333, MW334, MW335, MW336, MW804, and MW805 were not sampled in spring 2012.
2012 Semi-annual			
	Install monitoring well downgradient of Site M13 to replace monitoring wells AEHA14R and AEHA15	Intended to replace monitoring wells AEHA14R and AEHA15 which were removed from the monitoring program	Completed, monitoring well MW811 was installed October 2014
2012 Annual			
	No new recommendations		
2013 Semi-annual			
	Abandon two unidentified monitoring wells identified at Site M4 and Site M6.	Wells unidentified and not included in monitoring program	Completed April 2018. One of the unknown monitoring wells was actually Site M3 MW154.

TABLE 4-1

Summary of Recommendations
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

Report	Recommendation	Reasoning	Status Pending/Initiated/Completed
2013 Annual			
	Continue quarterly landfill cap inspections at Landfill M11 through 2014	October 2013 landfill inspection report missing.	Completed, last quarterly inspection in 2014
	Do not abandon monitoring well AEHA14R as previously recommended by IEPA	Provides water level control point for Site M13.	Completed
	Redesignate Site L1 monitoring well MW171 from bedrock to overburden	Bottom of the well screen at 7.9 ft bgs and top of bedrock at 8.0 ft bgs.	Completed
	Redesignate Site L14 monitoring well MW603 from overburden to combination	Bottom of the well screen at 16.0 ft bgs and top of bedrock at 13.0 ft bgs.	Completed
	Redesignate Site M1 monitoring well MW642 from overburden to bedrock	Top of the well screen at 29.0 ft bgs and top of bedrock at 29.0 ft bgs.	Completed
	Redesignate Site M1 monitoring well MW647 from overburden to bedrock	Top of the well screen at 7.3 ft bgs and top of bedrock at 6.0 ft bgs.	Completed
	Redesignate Site M1 monitoring well MW649 from overburden to combination	Top of the well screen at 7.0 ft bgs and top of bedrock at 7.5 ft bgs.	Completed
	Redesignate Site M3 monitoring well MW154 from bedrock to combination	Bottom of the well screen at 9.1 ft bgs and top of bedrock at 8.0 ft bgs.	Completed
	Redesignate Site M5 monitoring well MW354R from combination to overburden	Bottom of the well screen at 17.0 ft bgs and top of bedrock at 19.0 ft bgs.	Completed
	Redesignate Site M6 monitoring well MW162R from overburden to bedrock	Top of the well screen at 3.7 ft bgs and top of bedrock at 4.5 ft bgs.	Completed
	Redesignate Site M6 monitoring well MW320R from overburden to bedrock	Top of the well screen at 30.5 ft bgs and top of bedrock at 8.0 ft bgs.	Completed
	Redesignate Other Areas monitoring well MW119 from bedrock to combination	Top of the well screen at 3.3 ft bgs and top of bedrock at 6.0 ft bgs.	Completed
	Redesignate Site M11 monitoring well MW108 from bedrock to combination	Top of the well screen at 7.0 ft bgs and top of bedrock at 9.0 ft bgs.	Completed
	Redesignate Site M11 monitoring well MW804 from combination to bedrock	Top of the well screen at 5.0 ft bgs and top of bedrock at 3.5 ft bgs.	Completed
	Site M11 groundwater flow maps have been revised from a water table and potentiometric to a shallow and deep potentiometric map.	Insufficient overburden wells to create a water table map.	Completed
	Redesignate Site M13 monitoring well MW362 from bedrock to combination	Top of the well screen at 28.0 ft bgs and top of bedrock at 29.5 ft bgs.	Completed
2014 Semi-annual			
	Spot treat woody vegetation on Landfill L3 cap in spring 2015	Kill woody vegetation	Completed
	Continue quarterly inspections at Landfill M11 through 2014	October 2013 and January 2014 inspections not completed	Completed
	Remove small trees from Landfill M11 rip rap apron	Kill woody vegetation	Completed
	Spot treat woody vegetation on Landfill M11 cap in spring 2015	Kill woody vegetation	Completed
	Clear debris from drainage ditch on south side of Landfill M13	Allow proper drainage	NA - did not exist
	Spot treat woody vegetation on Landfill M13 cap in spring 2015	Kill woody vegetation	Completed
	Remove small trees from Landfill M13 rip rap apron	Kill woody vegetation	Completed
	Complete additional mowing around Landfill M13 perimeter	Reduce encroachment	Completed
2014 Annual			
	Reduce inspections at Landfill M11 from quarterly to annual.	Sections 4.2.2.2 and 4.2.2.3.3 of LTM Plan	Initiated, last quarterly inspection completed in 2014
	Reduce groundwater sampling at Landfill M13 from quarterly to semi-annually	Section 4.2.3.5 of LTM Plan	Initiated, last quarterly sampling completed in 2014
	Remove early warning monitoring well MW124R from LTM	Per Site M7 Groundwater Closure Report, no RG exceedances since 2009 with no upgradient source areas	Initiated, last sampled in October 2013
2015 Semi-annual			
	Repair well nest MW309/MW310R and MW311/MW312	Destroyed during CenterPoint construction activities	Completed August 2016
	Do not replace Site L3 monitoring well MW410	No previous detections, overburden well, source being removed, remaining overburden unknown	Approved
	If Site L3 monitoring well MW411 is replaced, is should be replaced as a shallow bedrock well	Provide potentiometric surface control point	Rescinded, well will not be replaced
2015 Annual			
	Modify well nest MW212R/MW215R stickup to current surface grade	Surface grade lowered during CenterPoint construction activities	Completed August 2016
	Complete monitoring well rehabilitation, excluding redevelopment	General monitoring well maintenance	Completed April 2017
	Remove SW557 and SW558 from the monitoring program after one sampling event following Landfill L3 removal activities completed	Sampling locations based on landfill physical features which will no longer exist	Initiated April 2017
	Cease quarterly inspections and mowing at Landfill L3 due to landfill removal. Quarterly inspections and mowing will not be completed in 2016.	Landfill removal	Initiated October 2015
	Remove TAL metals analysis from Site L3 following one round after landfill removal completed.	There have been no prior exceedances and the source (Landfill L3) will have been removed	Initiated April 2017
	Sample Site M1 monitoring well MW104 one-time in October 2016 for sulfate	Confirm there is not migration occurring from the vicinity of MW231 toward MW104	Completed October 2016

TABLE 4-1

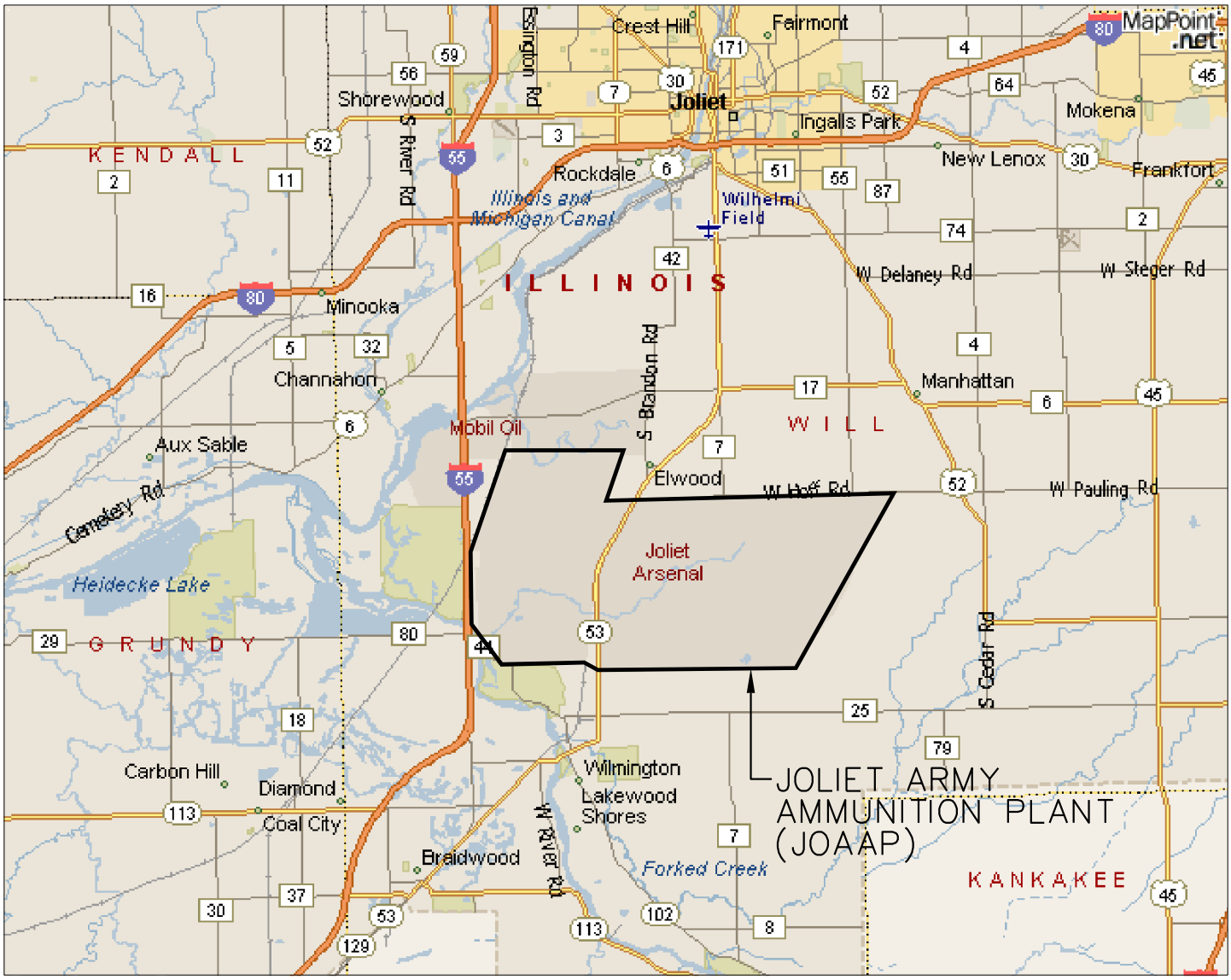
Summary of Recommendations
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

Report	Recommendation	Reasoning	Status Pending/Initiated/Completed
2016 Semi-annual			
	Do not replace Site L3 monitoring well MW411	Not included in LTM program, combination well, no remaining overburden, would not provide relevant flow data	Approved
2016 Annual			
	Remove Site L3 surface water sampling locations SW004, SW557, and SW558	Sampling locations based on Landfill L3, which has been removed and one round of sampling completed following removal	Initiated April 2017
	Remove TAL metals analysis from Site L3 following one round completed after landfill removal completed	There have been no prior exceedances and the source (Landfill L3) has been removed	Initiated April 2017
	Change monitoring well designations: MW412 – revised from In-plume/Downgradient to In-plume MW630, MW631, and MW633 – revised from Early Warning/Downgradient to Early Warning SW777 – revised from Compliance/Downgradient to Compliance	Landfill L3 removal completed and one round of sampling completed following removal	Approved
	Do not continue Site M1 monitoring well MW104 sampling for sulfate	Sampling in October 2016 indicated only a low level detection of sulfate at 6.6 mg/L.	Approved
2017 Semi-annual			
	Abandon destroyed Site M1 monitoring well MW648.	Monitoring well severely damaged by USDA mower. Based on groundwater flow direction and recent detections, monitoring well does not require replacement.	Completed April 2018.
2017 Annual			
	Abandon monitoring wells listed in Table 2-5.	Based on site closures (M3, M5, and M7) and monitoring wells at other sites that no longer provide useful information.	Completed April 2018. Monitoring wells L2-MW810 and M4-MW115 abandoned July 2018.
2018 Semi-annual			
	No new recommendations		
2018 Annual			
	Remove Site M1 monitoring well MW640 graph from the trend analysis. Remove Site M6 monitoring well MW318 graph from the trend analysis.	Concentrations from both locations have maintained below the RG.	Pending

Notes:

Does not include recommendations repeated in subsequent reports.

FIGURES



NOTE

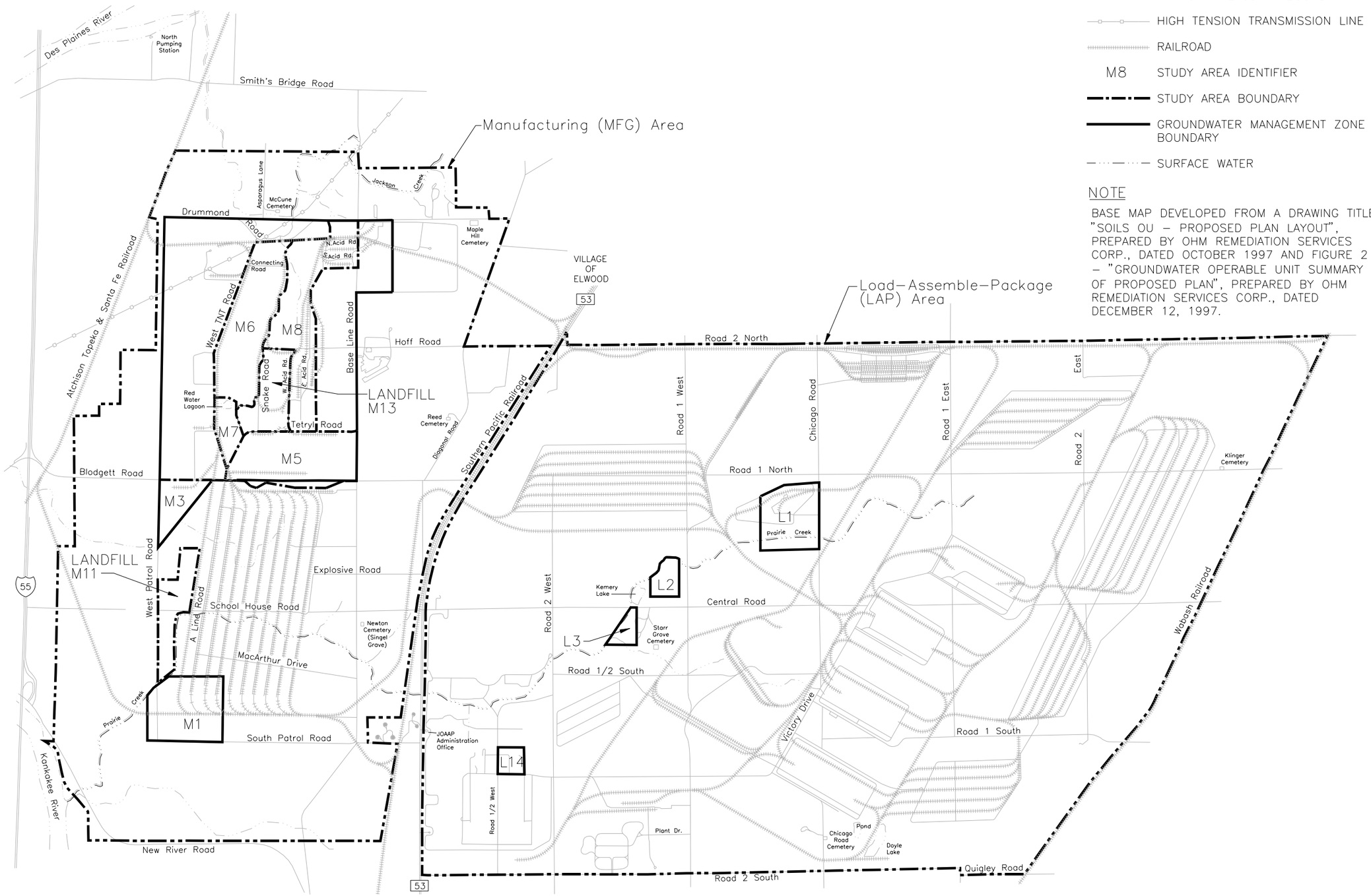
BASE MAP DEVELOPED FROM 2002 MICROSOFT CORPORATION, EXPEDIA.COM.

north

RJR DEVELOPED BY / TMM DRAWN BY	CONTRACT NO. W912QR-15-C-0016	SITE LOCATION MAP	FIGURE 1-1
1/15/2018 DATE / APPROVED BY	VERIFY SCALE 0 1/2 1 BAR REPRESENTS ONE INCH — SCALE 1"=4 Miles (Approx.)	2018 ANNUAL GROUNDWATER MONITORING REPORT JOLIET ARMY AMMUNITION PLANT WILL COUNTY, ILLINOIS	IEA MWH JOINT VENTURE
REVISIONS / DATE			

File: \\IEA-FLSRVR\J-Jobs\2028A USACE JOAAP\06.00 Design\06.04 Sheets_18fall_LocationMap_Fig1-1.dgn

Drawn By & Date: TMM 2/17/16 | Approved By & Date: RJR 2/17/16 | Revised By & Date: | Approved By & Date:



LEGEND

- APPROXIMATE JOAAP BOUNDARY
- HIGH TENSION TRANSMISSION LINE
- RAILROAD
- M8 STUDY AREA IDENTIFIER
- STUDY AREA BOUNDARY
- GROUNDWATER MANAGEMENT ZONE BOUNDARY
- SURFACE WATER

NOTE

BASE MAP DEVELOPED FROM A DRAWING TITLED "SOILS OU – PROPOSED PLAN LAYOUT", PREPARED BY OHM REMEDIATION SERVICES CORP., DATED OCTOBER 1997 AND FIGURE 2 – "GROUNDWATER OPERABLE UNIT SUMMARY OF PROPOSED PLAN", PREPARED BY OHM REMEDIATION SERVICES CORP., DATED DECEMBER 12, 1997.

Drawn By & Date: TMM 1/17/2019 | Approved By & Date: RJR 1/17/2019 | Revised By & Date: | Approved By & Date:

TMM DEVELOPED BY | TMM DRAWN BY | 1/15/2018 DATE | APPROVED BY

CONTRACT NO. W912QR-15-C-0016

VERIFY SCALE 0 1/2 1 — BAR REPRESENTS ONE INCH ON ORIGINAL — SCALE 1" = 4000'

REV	DATE	BY	DESCRIPTION

GROUNDWATER STUDY AREAS AND LANDFILL SITES

2018 ANNUAL GROUNDWATER MONITORING REPORT
JOLIET ARMY AMMUNITION PLANT
WILL COUNTY, ILLINOIS

PRINTED 1/17/2019

FIGURE 1-2

DRAWING NUMBER

IEA MWH JOINT VENTURE

LEGEND:

- MW131 (605.85) — OVERBURDEN MONITORING WELL LOCATION, NUMBER, AND WATER TABLE ELEVATION.
- MW177 — BEDROCK MONITORING WELL LOCATION AND NUMBER.
- SW550 (603.53) — SURFACE WATER MONITORING LOCATION, NUMBER, AND SURFACE WATER ELEVATION.
- 606 — WATER TABLE CONTOUR (CONTOUR INTERVAL: 1 FT) (DASHED WHERE INFERRED)
- DIRECTION OF WATER TABLE FLOW
- DIRECTION OF FLOW IN CREEK
- GROUNDWATER MANAGEMENT ZONE BOUNDARY

NOTES:

1. BASE MAP DEVELOPED FROM AN AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH, DATED 22 APRIL, 2017.
2. COORDINATES ARE UNIVERSAL TRANSVERSE MERCATOR (UTM), ZONE 16 NORTH, NORTH AMERICAN DATUM 1983 (NAD83).
3. WATER LEVELS MEASURED BY IEA/MWH JV PERSONNEL ON 1 OCTOBER, 2018.
4. MONITORING WELLS USED TO CREATE THE WATER TABLE MAP ARE SHOWN WITH ELEVATIONS.

north

Drawn By & Date: TMM 3/1/2019	Approved By & Date: RJR 3/1/2019	Revised By & Date:	Approved By & Date:

TMM — DEVELOPED BY
TMM — DRAWN BY
3/1/2019 — DATE
APPROVED BY
CONTRACT NO. W912QR-15-C-0016

VERIFY SCALE
0 1/2 1
BAR REPRESENTS ONE INCH ON ORIGINAL
SCALE 1" = 300'

REV	DATE	BY	DESCRIPTION

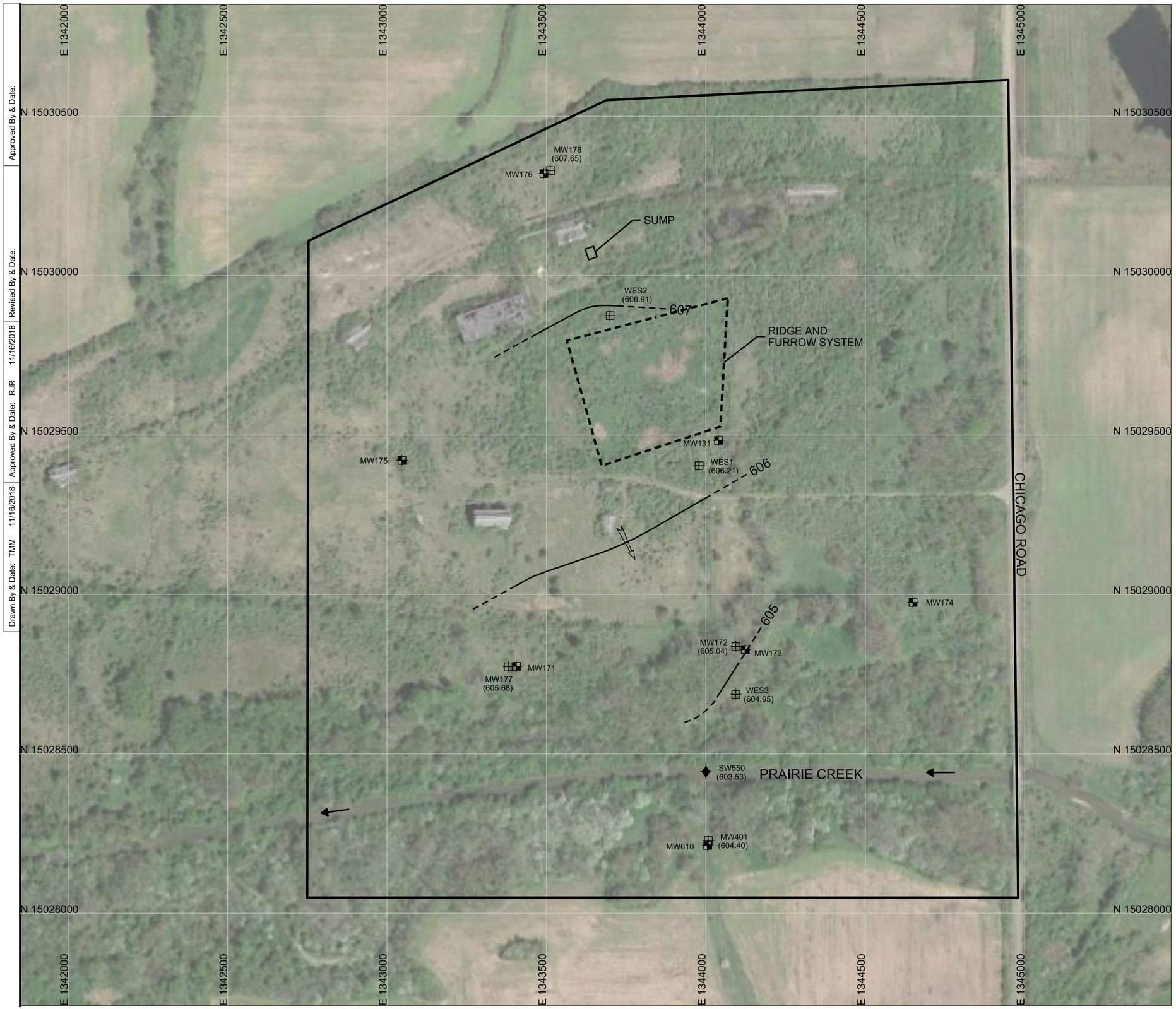
SITE FEATURES/WATER TABLE MAP - LAP AREA
SITE L1
(OCTOBER 2018)

2018 ANNUAL GROUNDWATER MONITORING REPORT
JOLIET ARMY AMMUNITION PLANT
WILL COUNTY, ILLINOIS

PRINTED
3/1/2019

FIGURE 3-1
DRAWING NUMBER

IEA MWH
JOINT VENTURE



LEGEND:

- MW171 — OVERBURDEN MONITORING WELL LOCATION, NUMBER.
- MW177 (605.68) — BEDROCK MONITORING WELL LOCATION, NUMBER AND POTENTIOMETRIC SURFACE ELEVATION.
- SW550 (603.53) — SURFACE WATER MONITORING LOCATION, NUMBER, AND SURFACE WATER ELEVATION (NOT USED IN POTENTIOMETRIC SURFACE CONTOURING.
- 606 — POTENTIOMETRIC SURFACE CONTOUR (CONTOUR INTERVAL: 1 FT) (DASHED WHERE INFERRED)
- DIRECTION OF BEDROCK FLOW
- DIRECTION OF FLOW IN CREEK
- GROUNDWATER MANAGEMENT ZONE BOUNDARY

NOTES:

1. BASE MAP DEVELOPED FROM AN AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH, DATED 22 APRIL, 2017.
2. COORDINATES ARE UNIVERSAL TRANSVERSE MERCATOR (UTM), ZONE 16 NORTH, NORTH AMERICAN DATUM 1983 (NAD83).
3. WATER LEVELS MEASURED BY IEA/MWH JV PERSONNEL ON 1 OCTOBER, 2018.
4. MONITORING WELLS USED TO CREATE THE POTENTIOMETRIC SURFACE MAP ARE SHOWN WITH ELEVATIONS.

north

Drawn By & Date: TMM 11/16/2018 | Approved By & Date: RJR 11/16/2018 | Revised By & Date: | Approved By & Date:

TMM — DEVELOPED BY | TMM — DRAWN BY | 11/16/2018 — DATE | APPROVED BY

CONTRACT NO. W912QR-15-C-0016

VERIFY SCALE — 0, 1/2, 1 — BAR REPRESENTS ONE INCH ON ORIGINAL

SCALE 1" = 300'

REV	DATE	BY	DESCRIPTION

POTENTIOMETRIC SURFACE MAP - LAP AREA
SITE L1
(OCTOBER 2018)

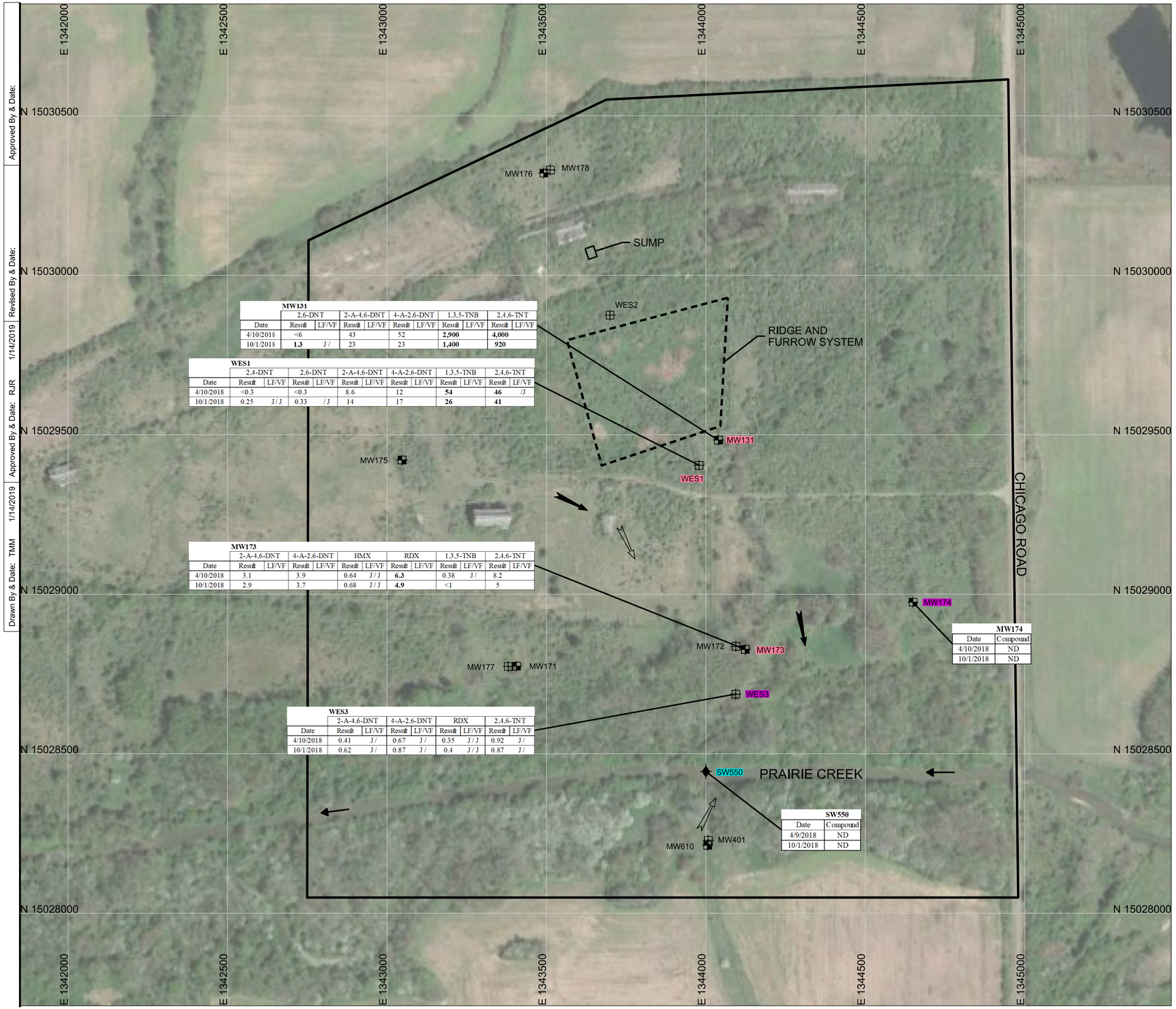
2018 ANNUAL GROUNDWATER MONITORING REPORT
JOLIET ARMY AMMUNITION PLANT
WILL COUNTY, ILLINOIS

PRINTED 11/16/2018

FIGURE 3-2

DRAWING NUMBER

IEA MWH
JOINT VENTURE



MW131	2,6-DNT		2-A-4,6-DNT		4-A-2,6-DNT		1,3,5-TNB		2,4,6-TNT	
Date	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF
4/10/2018	<6		43		52		**2,900**		**4,000**	
10/1/2018	**1.3**	J /	23		23		**1,400**		**920**	

WES1	2,4-DNT		2,6-DNT		2-A-4,6-DNT		4-A-2,6-DNT		1,3,5-TNB		2,4,6-TNT	
Date	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF
4/10/2018	<0.3		<0.3		8.6		12		**54**		**46**	/J
10/1/2018	0.25	J / J	0.33	/ J	14		17		**26**		**41**	

MW173	2-A-4,6-DNT		4-A-2,6-DNT		HMX		RDX		1,3,5-TNB		2,4,6-TNT	
Date	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF
4/10/2018	3.1		3.9		0.64	J / J	**6.3**		0.38	J /	8.2	
10/1/2018	2.9		3.7		0.68	J / J	**4.9**		<1		5	

MW174	
Date	Compound
4/10/2018	ND
10/1/2018	ND

WES3	2-A-4,6-DNT		4-A-2,6-DNT		RDX		2,4,6-TNT	
Date	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF
4/10/2018	0.41	J /	0.67	J /	0.35	J / J	0.92	J /
10/1/2018	0.62	J /	0.87	J /	0.4	J / J	0.87	J /

SW550	
Date	Compound
4/9/2018	ND
10/1/2018	ND

LEGEND:

- MW173 — OVERBURDEN MONITORING WELL LOCATION, NUMBER, AND EXPLOSIVES DETECTIONS.
- WES1 — BEDROCK MONITORING WELL LOCATION, NUMBER, AND EXPLOSIVES DETECTIONS.
- SW550 — SURFACE WATER MONITORING LOCATION, NUMBER, AND EXPLOSIVES DETECTIONS.
- DIRECTION OF WATER TABLE FLOW
- DIRECTION OF BEDROCK FLOW
- DIRECTION OF FLOW IN CREEK
- GROUNDWATER MANAGEMENT ZONE BOUNDARY
- IN-PLUME MONITORING POINT
- EARLY WARNING MONITORING POINT
- COMPLIANCE MONITORING POINT

2,4-DNT	2,4-DINITROTOLUENE
2,6-DNT	2,6-DINITROTOLUENE
1,3,5-TNB	1,3,5 TRINITROBENZENE
2,4,6-TNT	2,4,6-TRINITROTOLUENE
2-A-4,6-DNT	2-AMINO-4,6-DINITROTOLUENE
4-A-2,6-DNT	4-AMINO-2,6-DINITROTOLUENE
HMX	HIGH MELTING-POINT EXPLOSIVE
RDX	ROYAL DEMOLITION EXPLOSIVE
J	ESTIMATED CONCENTRATION
LF/VF	LAB FLAG/VALIDATION FLAG
µg/L	MICROGRAMS PER LITER
ND	NOT DETECTED
NS	NO STANDARD
RG	REMEDIATION GOAL

COMPOUND (µg/L)	PROJECT ACTION LIMIT	SURFACE WATER RG
2,4-DNT	0.42	150
2,6-DNT	0.42	150
1,3,5-TNB	5.1	15
2,4,6-TNT	9.5	75
2-A-4,6-DNT	NS	NS
4-A-2,6-DNT	NS	NS
HMX	5,100	260
RDX	2.6	500

NOTES:

1. PROJECT ACTION LIMITS ARE THE REMEDIAL GOALS AS SPECIFIED IN TABLE 6-2 OF THE 1998 RECORD OF DECISION. WHERE NO RG IS PRESENTED IN THE 1998 RECORD OF DECISION, THE PROJECT ACTION LIMIT IS OBTAINED FROM IEPA CLASS II GROUNDWATER STANDARDS.
2. THE SURFACE WATER PROJECT ACTION LIMITS ARE OBTAINED FROM TABLE 10-1 OF THE 1998 RECORD OF DECISION.
3. BASE MAP DEVELOPED FROM AN AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH, DATED 22 APRIL, 2017.
4. COORDINATES ARE UNIVERSAL TRANSVERSE MERCATOR (UTM), ZONE 16 NORTH, NORTH AMERICAN DATUM 1983 (NAD83).
5. SAMPLES COLLECTED BY IEA/MWH JV PERSONNEL ON 9, 10 APRIL AND 1 OCTOBER, 2018.
6. CONCENTRATIONS REPORTED IN MICROGRAMS PER LITER (µg/L).
7. BOLDED VALUE INDICATES RG EXCEEDANCE

north

Drawn By & Date: TMM 1/14/2019 | Approved By & Date: RJR 1/14/2019 | Revised By & Date: | Approved By & Date:

TMM DEVELOPED BY | TMM DRAWN BY | 1/14/2019 DATE | APPROVED BY

CONTRACT NO. W912QR-15-C-0016

VERIFY SCALE 0 1/2 1 — BAR REPRESENTS ONE INCH ON ORIGINAL — SCALE 1" = 300'

REV	DATE	BY	DESCRIPTION

EXPLOSIVES DETECTIONS - LAP AREA
SITE L1
(APRIL / OCTOBER 2018)

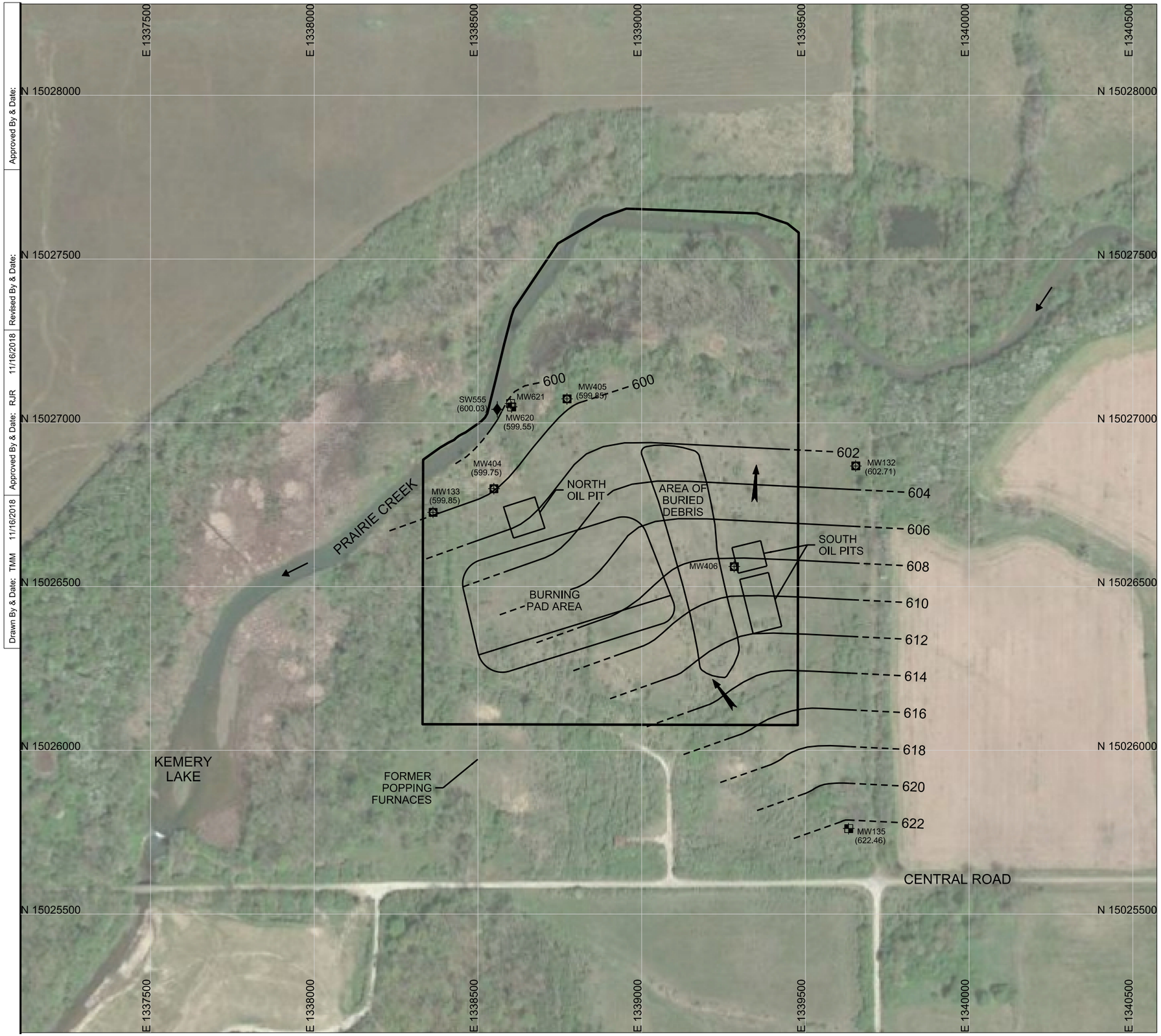
2018 ANNUAL GROUNDWATER MONITORING REPORT
JOLIET ARMY AMMUNITION PLANT
WILL COUNTY, ILLINOIS

PRINTED 1/14/2019

FIGURE 3-3

DRAWING NUMBER

IEA MWH JOINT VENTURE



LEGEND:

- MW135 (622.46) OVERBURDEN MONITORING WELL LOCATION, NUMBER, AND WATER TABLE ELEVATION.
- MW133 (599.85) COMBINED MONITORING WELL LOCATION, NUMBER, AND WATER TABLE ELEVATION.
- MW621 BEDROCK MONITORING WELL LOCATION AND NUMBER.
- SW555 (600.03) SURFACE WATER LOCATION NUMBER, AND WATER ELEVATION
- 606 — WATER TABLE CONTOUR (CONTOUR INTERVAL: 2 FT) (DASHED WHERE INFERRED)
- DIRECTION OF WATER TABLE FLOW
- DIRECTION OF FLOW IN CREEK
- GROUNDWATER MANAGEMENT ZONE BOUNDARY

NOTES:

1. BASE MAP DEVELOPED FROM AN AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH, DATED 22 APRIL, 2017.
2. COORDINATES ARE UNIVERSAL TRANSVERSE MERCATOR (UTM), ZONE 16 NORTH, NORTH AMERICAN DATUM 1983 (NAD83).
3. WATER LEVELS MEASURED BY IEA/MWH JV PERSONNEL ON 4 OCTOBER, 2018.
4. MONITORING WELLS USED TO CREATE THE WATER TABLE MAP ARE SHOWN WITH ELEVATIONS.

north

Drawn By & Date: TMM 11/16/2018 | Approved By & Date: RJR 11/16/2018 | Revised By & Date: | Approved By & Date:

TMM DEVELOPED BY | TMM DRAWN BY | 11/16/2018 DATE | CONTRACT NO. W912QR-15-C-0016

VERIFY SCALE 0 1/2 1 — BAR REPRESENTS ONE INCH ON ORIGINAL — SCALE 1" = 300'

REV	DATE	BY	DESCRIPTION

SITE FEATURES/WATER TABLE MAP - LAP AREA
SITE L2
(OCTOBER 2018)

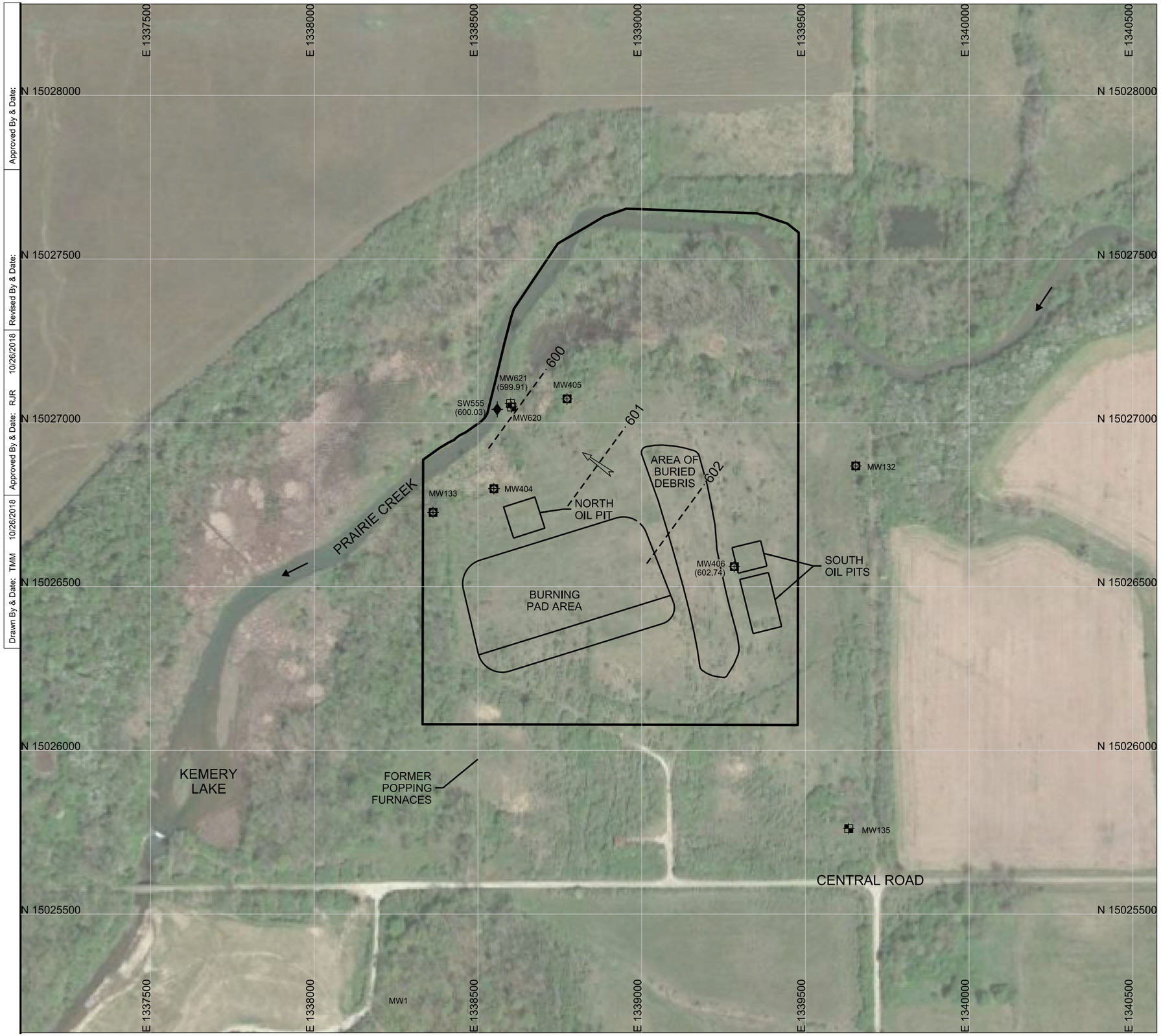
2018 ANNUAL GROUNDWATER MONITORING REPORT
JOLIET ARMY AMMUNITION PLANT
WILL COUNTY, ILLINOIS

PRINTED 11/16/2018

FIGURE 3-4

DRAWING NUMBER

IEA MWH JOINT VENTURE



LEGEND:

- MW135 — OVERBURDEN MONITORING WELL LOCATION AND NUMBER.
- MW406 (602.74) — COMBINED MONITORING WELL LOCATION, NUMBER AND POTENTIOMETRIC SURFACE ELEVATON.
- MW621 (599.91) — BEDROCK MONITORING WELL LOCATION, NUMBER AND POTENTIOMETRIC SURFACE ELEVATION.
- SW555 (600.03) — SURFACE WATER LOCATION, NUMBER, AND SURFACE WATER ELEVATION. (NOT USED IN POTENTIOMETRIC SURFACE CONTOURING.
- 601 — POTENTIOMETRIC SURFACE CONTOUR (CONTOUR INTERVAL: 1 FT) (DASHED WHERE INFERRED)
- DIRECTION OF BEDROCK FLOW
- DIRECTION OF FLOW IN CREEK
- GROUNDWATER MANAGEMENT ZONE BOUNDARY

NOTES:

1. BASE MAP DEVELOPED FROM AN AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH, DATED 22 APRIL, 2017.
2. COORDINATES ARE UNIVERSAL TRANSVERSE MERCATOR (UTM), ZONE 16 NORTH, NORTH AMERICAN DATUM 1983 (NAD 83).
3. WATER LEVELS MEASURED BY IEA/MWH JV PERSONNEL ON 4 OCTOBER, 2018.
4. MONITORING WELLS USED TO CREATE THE WATER TABLE MAP ARE SHOWN WITH ELEVATIONS.

north

Drawn By & Date: TMM 10/26/2018	Approved By & Date: RJR 10/26/2018	Revised By & Date:	Approved By & Date:

TMM — DEVELOPED BY
TMM — DRAWN BY
10/26/2018 — DATE
APPROVED BY
CONTRACT NO. W912QR-15-C-0016

VERIFY SCALE
0 1/2 1
BAR REPRESENTS ONE INCH ON ORIGINAL
SCALE 1" = 300'

REV	DATE	BY	DESCRIPTION

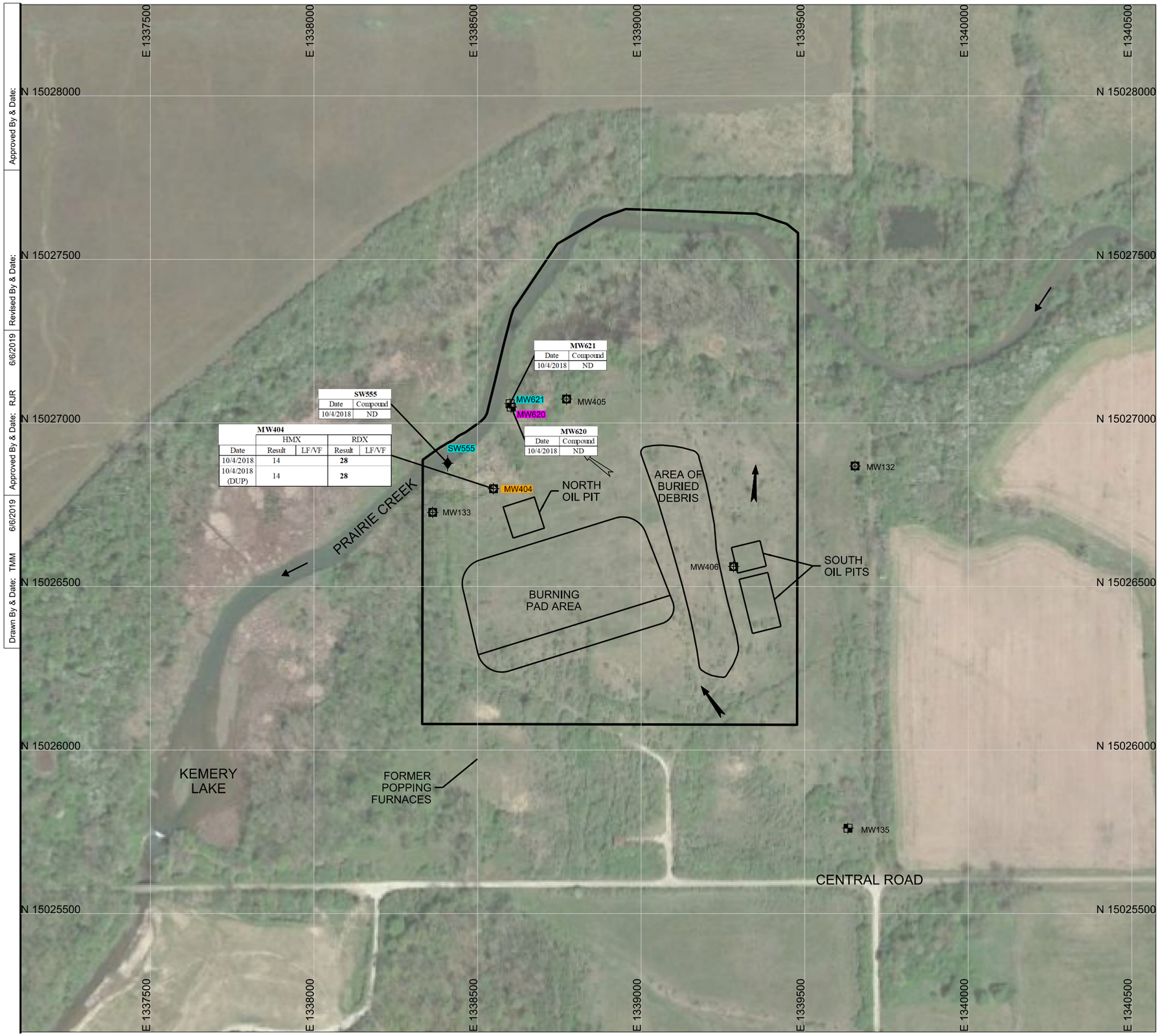
POTENTIOMETRIC SURFACE MAP - LAP AREA
SITE L2
(OCTOBER 2018)

2018 ANNUAL GROUNDWATER MONITORING REPORT
JOLIET ARMY AMMUNITION PLANT
WILL COUNTY, ILLINOIS

PRINTED
10/26/2018

FIGURE 3-5
DRAWING NUMBER

IEA MWH
JOINT VENTURE



LEGEND:

MW620	OVERBURDEN MONITORING WELL LOCATION, NUMBER, AND EXPLOSIVES DETECTIONS.
MW133	COMBINED MONITORING WELL LOCATION, NUMBER, AND EXPLOSIVES DETECTIONS.
MW621	BEDROCK MONITORING WELL LOCATION, NUMBER AND EXPLOSIVES DETECTIONS.
SW555	SURFACE WATER MONITORING LOCATION, NUMBER, AND EXPLOSIVES DETECTIONS.
	DIRECTION OF WATER TABLE FLOW
	DIRECTION OF BEDROCK FLOW
	DIRECTION OF FLOW IN CREEK
	GROUNDWATER MANAGEMENT ZONE BOUNDARY
	IN-PLUME/DOWNGRADIENT MONITORING POINT
	EARLY WARNING/DOWNGRADIENT MONITORING POINT
	COMPLIANCE/DOWNGRADIENT AND UPGRADIENT MONITORING POINT
2,4,6-TNT	2,4,6-TRINITROTOLUENE
DUP	DUPLICATE
ND	NOT DETECTED
HMX	HIGH MELTING-POINT EXPLOSIVE
LF/VF	LAB FLAG/VALIDATION FLAG
µg/L	MICROGRAMS PER LITER
RG	REMEDIATION GOAL

COMPOUND (µg/L)	PROJECT ACTION LIMIT	SURFACE WATER RG
2,4,6-TNT	9.5	75
HMX	5100	260

NOTES:

1. PROJECT ACTION LIMITS ARE THE REMEDIAL GOALS AS SPECIFIED IN TABLE 6-2 OF THE 1998 RECORD OF DECISION. WHERE NO RG IS PRESENTED IN THE 1998 RECORD OF DECISION, THE PROJECT ACTION LIMIT IS OBTAINED FROM IEPA CLASS II GROUNDWATER STANDARDS.
2. THE SURFACE WATER PROJECT ACTION LIMITS ARE OBTAINED FROM TABLE 10-1 OF THE 1998 RECORD OF DECISION.
3. BASE MAP DEVELOPED FROM AN AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH, DATED 22 APRIL, 2017.
4. COORDINATES ARE UNIVERSAL TRANSVERSE MERCATOR (UTM), ZONE 16 NORTH, NORTH AMERICAN DATUM 1983 (NAD 83)
5. SAMPLES COLLECTED BY IEA/MWH JV PERSONNEL ON 4 OCTOBER, 2018.
6. CONCENTRATIONS REPORTED IN MICROGRAMS PER LITER (µg/L).
7. BOLDED VALUE INDICATES RG EXCEEDANCE

north

Approved By & Date:
Revised By & Date:
Approved By & Date: RJR 6/6/2019
Drawn By & Date: TMM 6/6/2019

TMM DEVELOPED BY
TMM DRAWN BY
APPROVED BY
6/6/2019 DATE

CONTRACT NO. W912QR-15-C-0016

VERIFY SCALE
0 1/2 1
BAR REPRESENTS ONE INCH ON ORIGINAL
SCALE 1" = 300'

REV	DATE	BY	DESCRIPTION

EXPLOSIVES DETECTIONS - LAP AREA
SITE L2
(OCTOBER 2018)

2018 ANNUAL GROUNDWATER MONITORING REPORT
JOLIET ARMY AMMUNITION PLANT
WILL COUNTY, ILLINOIS

PRINTED
6/6/2019

FIGURE 3-6
DRAWING NUMBER

IEA MWH
JOINT VENTURE

LEGEND:

- MW136 (591.71) — COMBINED MONITORING WELL LOCATION, NUMBER, AND WATER TABLE ELEVATION.
- MW630 — SHALLOW BEDROCK MONITORING WELL LOCATION AND NUMBER.
- MW633 — DEEPER BEDROCK MONITORING WELL LOCATION AND NUMBER.
- SW777 (588.72) — SURFACE WATER MONITORING LOCATION, NUMBER, AND SURFACE WATER ELEVATION.
- 590 — WATER TABLE CONTOUR (CONTOUR INTERVAL: 1 FT) (DASHED WHERE INFERRED)
- DIRECTION OF WATER TABLE FLOW
- DIRECTION OF FLOW IN CREEK
- GROUNDWATER MANAGEMENT ZONE BOUNDARY
- APPROXIMATE LIMITS OF FORMER LANDFILL

NOTES:

1. BASE MAP DEVELOPED FROM AN AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH, DATED 22 APRIL, 2017.
2. COORDINATES ARE UNIVERSAL TRANSVERSE MERCATOR (UTM), ZONE 16 NORTH, NORTH AMERICAN DATUM 1983 (NAD83).
3. WATER LEVELS MEASURED BY IEA/MWH JV PERSONNEL ON 6 OCTOBER, 2018.
4. MONITORING WELLS USED TO CREATE THE WATER TABLE MAP ARE SHOWN WITH ELEVATIONS.
5. APPROXIMATE LIMITS OF FORMER LANDFILL OBTAINED FROM SITE L3 CLOSURE REPORT, PREPARED BY MWH, DATED JUNE 25, 2010.
6. MW136 IS A COMBINATION OVERBURDEN/BEDROCK WELL USED AS A HORIZONTAL CONTROL POINT.
7. LANDFILL REMOVAL ACTIVITIES COMPLETED AUGUST 2016.

north

Approved By & Date:
Revised By & Date:
Approved By & Date: RJR 11/16/2018
Drawn By & Date: TMM 11/16/2018

TMM DEVELOPED BY
TMM DRAWN BY
11/16/2018 DATE
APPROVED BY
CONTRACT NO. W912QR-15-C-0016

VERIFY SCALE
0 1/2 1
BAR REPRESENTS ONE INCH ON ORIGINAL
SCALE 1" = 200'

REV	DATE	BY	DESCRIPTION

SITE FEATURES/WATER TABLE MAP - LAP AREA
SITE L3
(OCTOBER 2018)

2018 ANNUAL GROUNDWATER MONITORING REPORT
JOLIET ARMY AMMUNITION PLANT
WILL COUNTY, ILLINOIS

PRINTED
11/16/2018

FIGURE 3-7
DRAWING NUMBER

IEA MWH
JOINT VENTURE

LEGEND:

- MW136 (591.71) — COMBINED MONITORING WELL LOCATION, NUMBER, AND POTENTIOMETRIC SURFACE ELEVATION.
- MW630 (587.82) — SHALLOW BEDROCK MONITORING WELL LOCATION, NUMBER AND POTENTIOMETRIC SURFACE ELEVATION.
- MW633 (588.73) — DEEPER BEDROCK MONITORING WELL LOCATION, NUMBER AND POTENTIOMETRIC SURFACE ELEVATION.
- SW777 (588.72) — SURFACE WATER MONITORING LOCATION, NUMBER, AND SURFACE WATER ELEVATION (NOT USED IN POTENTIOMETRIC SURFACE CONTOURING.
- 590 — POTENTIOMETRIC SURFACE CONTOUR (CONTOUR INTERVAL: 1 FT) (DASHED WHERE INFERRED)
- DIRECTION OF BEDROCK FLOW
- DIRECTION OF FLOW IN CREEK
- GROUNDWATER MANAGEMENT ZONE BOUNDARY
- APPROXIMATE LIMITS OF FORMER LANDFILL

NOTES:

1. BASE MAP DEVELOPED FROM AN AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH, DATED 22 APRIL, 2017.
2. COORDINATES ARE UNIVERSAL TRANSVERSE MERCATOR (UTM), ZONE 16 NORTH, NORTH AMERICAN DATUM 1983 (NAD83).
3. WATER LEVELS MEASURED BY IEA/MWH JV PERSONNEL ON 6 OCTOBER, 2018.
4. MONITORING WELLS USED TO CREATE THE POTENTIOMETRIC SURFACE MAP ARE SHOWN WITH ELEVATIONS.
5. APPROXIMATE LIMITS OF FORMER LANDFILL OBTAINED FROM SITE L3 CLOSURE REPORT, PREPARED BY MWH, DATED JUNE 25, 2010.
6. MW136 IS A COMBINATION OVERBURDEN/BEDROCK WELL USED AS A HORIZONTAL CONTROL POINT.
7. LANDFILL REMOVAL ACTIVITIES COMPLETED AUGUST 2016.

north

Approved By & Date:
Revised By & Date:
Approved By & Date: RJR 10/26/2018
Drawn By & Date: TMM 10/26/2018

TMM — DEVELOPED BY
TMM — DRAWN BY
10/26/2018 — DATE
APPROVED BY
CONTRACT NO. W912QR-15-C-0016

VERIFY SCALE
0 1/2 1
BAR REPRESENTS ONE INCH ON ORIGINAL
SCALE 1" = 200'

REV	DATE	BY	DESCRIPTION

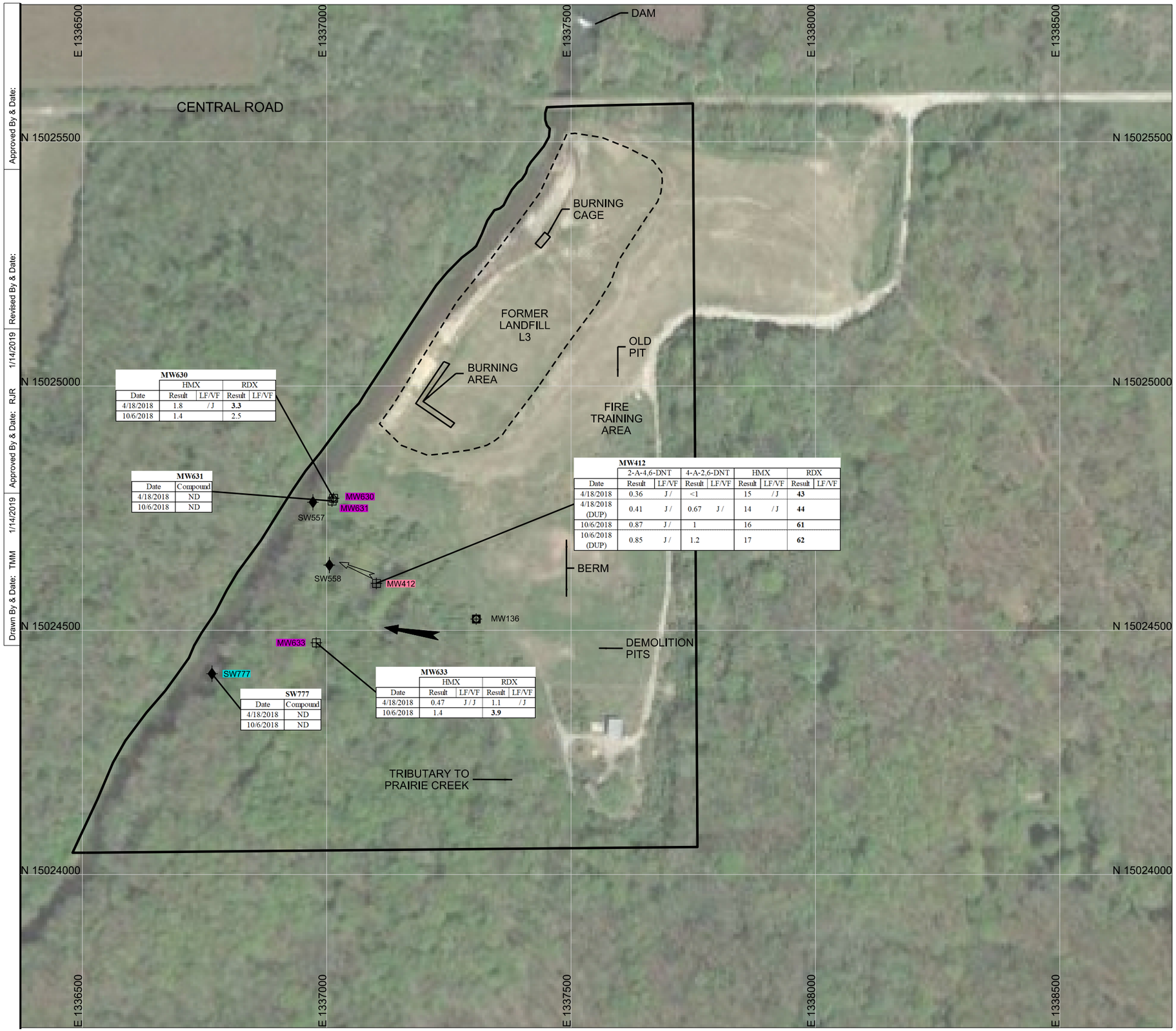
POTENTIOMETRIC SURFACE MAP - LAP AREA
SITE L3
(OCTOBER 2018)

2018 ANNUAL GROUNDWATER MONITORING REPORT
JOLIET ARMY AMMUNITION PLANT
WILL COUNTY, ILLINOIS

PRINTED
10/26/2018

FIGURE 3-8
DRAWING NUMBER

IEA MWH
JOINT VENTURE



MW630

	HMX		RDX	
Date	Result	LF/VF	Result	LF/VF
4/18/2018	1.8	/ J	**3.3**	
10/6/2018	1.4		2.5	

MW631

Date	Compound
4/18/2018	ND
10/6/2018	ND

MW412

	2-A-4,6-DNT		4-A-2,6-DNT		HMX		RDX	
Date	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF
4/18/2018	0.36	J /	<1		15	/ J	**43**	
4/18/2018 (DUP)	0.41	J /	0.67	J /	14	/ J	**44**	
10/6/2018	0.87	J /	1		16		**61**	
10/6/2018 (DUP)	0.85	J /	1.2		17		**62**	

MW633

	HMX		RDX	
Date	Result	LF/VF	Result	LF/VF
4/18/2018	0.47	J / J	1.1	/ J
10/6/2018	1.4		**3.9**	

SW777

Date	Compound
4/18/2018	ND
10/6/2018	ND

LEGEND:

- MW136 — COMBINED MONITORING WELL LOCATION AND NUMBER.
- MW630 — SHALLOW BEDROCK MONITORING WELL LOCATION, NUMBER AND EXPLOSIVES DETECTIONS.
- MW633 — DEEPER BEDROCK MONITORING WELL LOCATION, NUMBER AND EXPLOSIVES DETECTIONS.
- SW777 — SURFACE WATER MONITORING LOCATION, NUMBER, AND EXPLOSIVES DETECTIONS.
- DIRECTION OF WATER TABLE FLOW
- DIRECTION OF BEDROCK FLOW
- DIRECTION OF FLOW IN CREEK
- GROUNDWATER MANAGEMENT ZONE BOUNDARY
- APPROXIMATE LIMITS OF LANDFILL
- IN-PLUME/DOWNGRADIENT MONITORING POINT
- EARLY WARNING/DOWNGRADIENT MONITORING POINT
- COMPLIANCE/DOWNGRADIENT AND UPGRADIENT MONITORING POINT

2-A-4,6-DNT	2-AMINO-4,6-DINITROTOLUENE
4-A-2,6-DNT	4-AMINO-2,6-DINITROTOLUENE
HMX	HIGH MELTING-POINT EXPLOSIVE
RDX	ROYAL DEMOLITION EXPLOSIVE
DUP	DUPLICATE
J	ESTIMATED CONCENTRATION
LF/VF	LAB FLAG/VALIDATION FLAG
µg/L	MICROGRAMS PER LITER
ND	NOT DETECTED
NS	NO STANDARD
RG	REMEDIATION GOAL

COMPOUND (µg/L)	PROJECT ACTION LIMIT	SURFACE WATER RG
2-A-4,6-DNT	NS	NS
4-A-2,6-DNT	NS	NS
HMX	5,100	260
RDX	2.6	500

NOTES:

1. PROJECT ACTION LIMITS ARE THE REMEDIAL GOALS AS SPECIFIED IN TABLE 6-2 OF THE 1998 RECORD OF DECISION. WHERE NO RG IS PRESENTED IN THE 1998 RECORD OF DECISION, THE PROJECT ACTION LIMIT IS OBTAINED FROM IEPA CLASS II GROUNDWATER STANDARDS.
2. THE SURFACE WATER PROJECT ACTION LIMITS ARE OBTAINED FROM TABLE 10-1 OF THE 1998 RECORD OF DECISION.
3. BASE MAP DEVELOPED FROM AN AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH, DATED 22 APRIL, 2017.
4. COORDINATES ARE UNIVERSAL TRANSVERSE MERCATOR (UTM), ZONE 16 NORTH, NORTH AMERICAN DATUM 1983 (NAD83).
5. SAMPLES COLLECTED BY IEA/MWH JV PERSONNEL ON 18 APRIL AND 6 OCTOBER, 2018.
6. CONCENTRATIONS REPORTED IN MICROGRAMS PER LITER (µg/L).
7. BOLDED VALUE INDICATES RG EXCEEDANCE.
8. APPROXIMATE LIMITS OF FORMER LANDFILL OBTAINED FROM SITE L3 CLOSURE REPORT, PREPARED BY MWH, DATED JUNE 25, 2010.
9. LANDFILL REMOVAL ACTIVITIES COMPLETED AUGUST 2016.

north

Approved By & Date:
Revised By & Date:
Approved By & Date: RJR 1/14/2019
Drawn By & Date: TMM 1/14/2019

TMM DEVELOPED BY
TMM DRAWN BY
1/14/2019 DATE
CONTRACT NO. W912QR-15-C-0016

VERIFY SCALE
BAR REPRESENTS ONE INCH ON ORIGINAL
SCALE 1" = 200'

REV	DATE	BY	DESCRIPTION

EXPLOSIVES DETECTIONS - LAP AREA
SITE L3
(APRIL / OCTOBER 2018)

2018 ANNUAL GROUNDWATER MONITORING REPORT
JOLIET ARMY AMMUNITION PLANT
WILL COUNTY, ILLINOIS

PRINTED 1/14/2019

FIGURE 3-9
DRAWING NUMBER

IEA MWH
JOINT VENTURE

LEGEND:

- MW512 (577.24) — OVERBURDEN MONITORING WELL LOCATION, NUMBER, AND WATER TABLE ELEVATION.
- MW603 (570.27) — COMBINED MONITORING WELL LOCATION, NUMBER, AND WATER TABLE ELEVATION.
- MW602 — BEDROCK MONITORING WELL LOCATION AND NUMBER.
- 574 — WATER TABLE CONTOUR (CONTOUR INTERVAL: 1 FT) (DASHED WHERE INFERRED)
- DIRECTION OF WATER TABLE FLOW
- GROUNDWATER MANAGEMENT ZONE BOUNDARY

NOTES:

1. BASE MAP DEVELOPED FROM AN AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH, DATED 22 APRIL, 2017.
2. COORDINATES ARE UNIVERSAL TRANSVERSE MERCATOR (UTM), ZONE 16 NORTH, NORTH AMERICAN DATUM 1983 (NAD 83).
3. WATER LEVELS MEASURED BY IEA/MWH JV PERSONNEL ON 1 OCTOBER, 2018.
4. MONITORING WELLS USED TO CREATE THE WATER TABLE MAP ARE SHOWN WITH ELEVATIONS.

north

Approved By & Date:
Revised By & Date:
Approved By & Date: RJR 11/16/2018
Drawn By & Date: TMM 11/16/2018

DEVELOPED BY: TMM
DRAWN BY: TMM
APPROVED BY: RJR
DATE: 11/16/2018

CONTRACT NO. W912QR-15-C-0016

VERIFY SCALE
0 1/2 1
BAR REPRESENTS ONE INCH ON ORIGINAL
SCALE 1" = 200'

REV	DATE	BY	DESCRIPTION

SITE FEATURES/WATER TABLE MAP - LAP AREA
SITE L14
(OCTOBER 2018)

2018 ANNUAL GROUNDWATER MONITORING REPORT
JOLIET ARMY AMMUNITION PLANT
WILL COUNTY, ILLINOIS

PRINTED
11/16/2018

FIGURE 3-10
DRAWING NUMBER

IEA MWH
JOINT VENTURE

LEGEND:

- MW512 — OVERBURDEN MONITORING WELL LOCATION AND NUMBER.
- MW140 (573.25) — COMBINED MONITORING WELL LOCATION, NUMBER, AND POTENTIOMETRIC SURFACE ELEVATION.
- MW602 (571.40) — BEDROCK MONITORING WELL LOCATION, NUMBER AND POTENTIOMETRIC SURFACE ELEVATION.
- 572 — POTENTIOMETRIC SURFACE CONTOUR (CONTOUR INTERVAL: 1 FT) (DASHED WHERE INFERRED)
- DIRECTION OF BEDROCK FLOW
- GROUNDWATER MANAGEMENT ZONE BOUNDARY

NOTES:

1. BASE MAP DEVELOPED FROM AN AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH, DATED 22 APRIL, 2017.
2. COORDINATES ARE UNIVERSAL TRANSVERSE MERCATOR (UTM), ZONE 16 NORTH, NORTH AMERICAN DATUM 1983 (NAD 83).
3. WATER LEVELS MEASURED BY IEA/MWH JV PERSONNEL ON 1 OCTOBER, 2018.
4. MONITORING WELLS USED TO CREATE THE POTENTIOMETRIC SURFACE MAP ARE SHOWN WITH ELEVATIONS.
5. MW140 IS A COMBINATION OVERBURDEN/BEDROCK WELL USED AS A HORIZONTAL CONTROL POINT.

north

Drawn By & Date: TMM 10/26/2018	Approved By & Date: RJR 10/26/2018	Revised By & Date:	Approved By & Date:

TMM — DEVELOPED BY
TMM — DRAWN BY
10/26/2018 — DATE
APPROVED BY
CONTRACT NO. W912QR-15-C-0016

VERIFY SCALE
0 1/2 1
BAR REPRESENTS ONE INCH ON ORIGINAL
SCALE 1" = 200'

REV	DATE	BY	DESCRIPTION

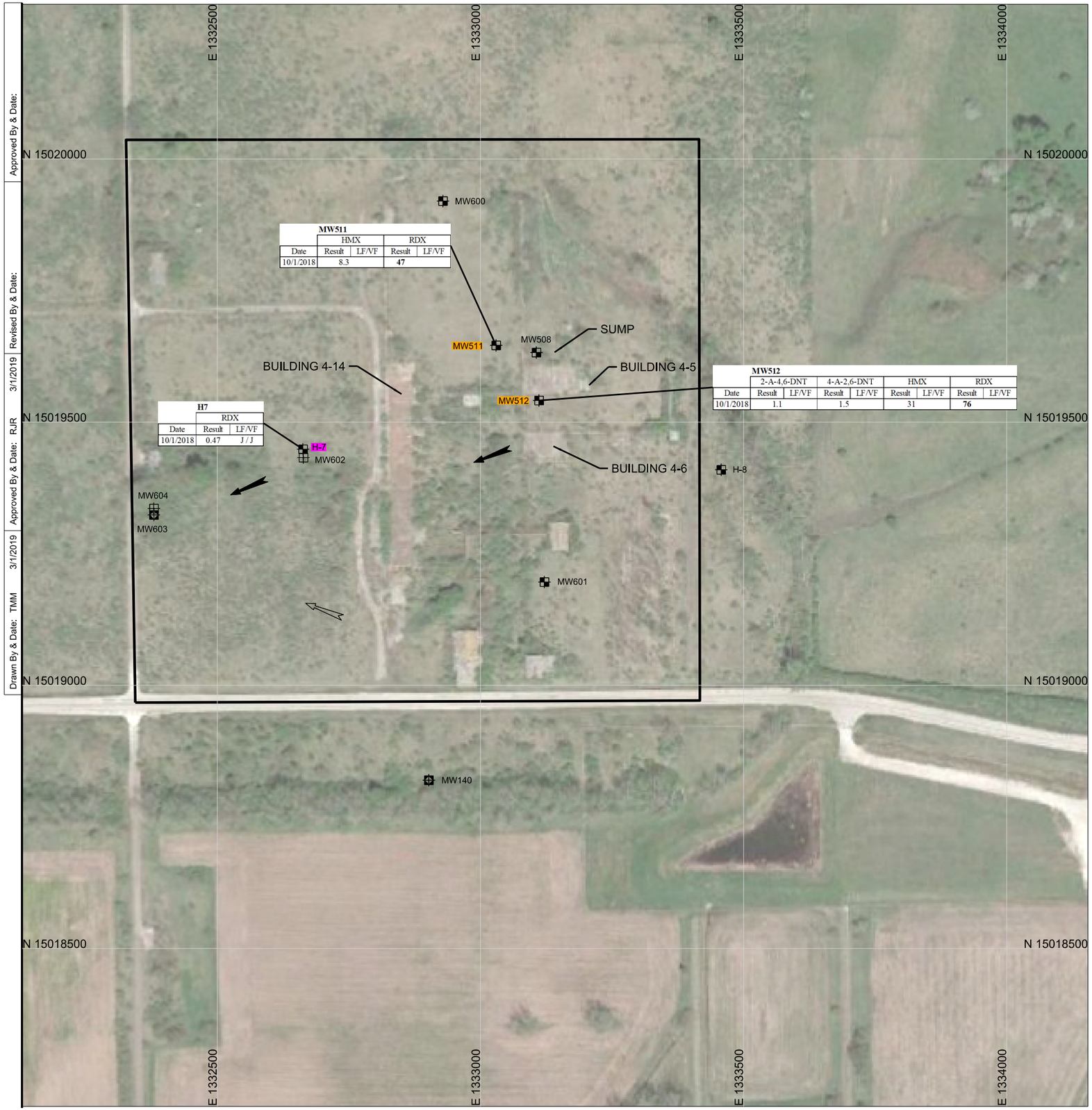
POTENTIOMETRIC SURFACE MAP - LAP AREA
SITE L14
(OCTOBER 2018)

2018 ANNUAL GROUNDWATER MONITORING REPORT
JOLIET ARMY AMMUNITION PLANT
WILL COUNTY, ILLINOIS

PRINTED
10/26/2018

FIGURE 3-11
DRAWING NUMBER

IEA MWH
JOINT VENTURE



MW511	HMX		RDX	
Date	Result	LF/VF	Result	LF/VF
10/1/2018	8.3		**47**	

MW512	2-A-4,6-DNT		4-A-2,6-DNT		HMX		RDX	
Date	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF
10/1/2018	1.1		1.5		31		**76**	

H7	RDX	
Date	Result	LF/VF
10/1/2018	0.47	J / J

LEGEND:

- MW512 — OVERBURDEN MONITORING WELL LOCATION, NUMBER, AND EXPLOSIVES DETECTIONS.
- MW140 — COMBINED MONITORING WELL LOCATION AND NUMBER.
- MW604 — BEDROCK MONITORING WELL LOCATION, NUMBER AND EXPLOSIVES DETECTIONS.
- DIRECTION OF WATER TABLE FLOW
- DIRECTION OF BEDROCK FLOW
- GROUNDWATER MANAGEMENT ZONE BOUNDARY
- RDX — ROYAL DEMOLITION EXPLOSIVE
- J — ESTIMATED CONCENTRATION
- LF/VF — LAB FLAG/VALIDATION FLAG
- µg/L — MICROGRAMS PER LITER
- NS — NO STANDARD
- RG — REMEDIATION GOAL
- IN-PLUME MONITORING POINT
- EARLY WARNING MONITORING POINT

COMPOUND (µg/L)	PROJECT ACTION LIMIT (1)
RDX	2.6

NOTES:

1. PROJECT ACTION LIMITS ARE THE REMEDIAL GOALS AS SPECIFIED IN TABLE 6-2 OF THE 1998 RECORD OF DECISION. WHERE NO RG IS PRESENTED IN THE 1998 RECORD OF DECISION, THE PROJECT ACTION LIMIT IS OBTAINED FROM IEPA CLASS II GROUNDWATER STANDARDS.
2. BASE MAP DEVELOPED FROM AN AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH, DATED 22 APRIL, 2017.
3. COORDINATES ARE UNIVERSAL TRANSVERSE MERCATOR (UTM), ZONE 16 NORTH, NORTH AMERICAN DATUM 1983 (NAD83).
4. SAMPLES COLLECTED BY IEA/MWH JV PERSONNEL ON 1 OCTOBER, 2018.
5. CONCENTRATIONS REPORTED IN MICROGRAMS PER LITER (µg/L).
6. BOLDED VALUE INDICATES RG EXCEEDANCE.

north

Drawn By & Date: TMM 3/1/2019 | Approved By & Date: RJR 3/1/2019 | Revised By & Date: | Approved By & Date:

TMM — DEVELOPED BY | TMM — DRAWN BY | 3/1/2019 — DATE | APPROVED BY

CONTRACT NO. W912QR-15-C-0016

VERIFY SCALE — BAR REPRESENTS ONE INCH ON ORIGINAL — SCALE 1" = 200'

REV	DATE	BY	DESCRIPTION

EXPLOSIVES DETECTIONS - LAP AREA
SITE L14
(OCTOBER 2018)

2018 ANNUAL GROUNDWATER MONITORING REPORT
JOLIET ARMY AMMUNITION PLANT
WILL COUNTY, ILLINOIS

PRINTED 3/1/2019

FIGURE 3-12
DRAWING NUMBER

IEA MWH JOINT VENTURE

LEGEND:

- MW104 (540.07) OVERBURDEN MONITORING WELL LOCATION, NUMBER, AND WATER TABLE ELEVATION.
- MW649 (533.31) COMBINED MONITORING WELL LOCATION, NUMBER, AND WATER TABLE ELEVATION.
- MW642 BEDROCK MONITORING WELL LOCATION AND NUMBER.
- SW709 (532.10) SURFACE WATER MONITORING LOCATION, NUMBER, AND SURFACE WATER ELEVATION.
- 540 WATER TABLE CONTOUR (CONTOUR INTERVAL: 1 FT) (DASHED WHERE INFERRED)
- DIRECTION OF WATER TABLE FLOW
- DIRECTION OF FLOW IN CREEK
- GROUNDWATER MANAGEMENT ZONE BOUNDARY

NOTES:

1. BASE MAP DEVELOPED FROM AN AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH, DATED 22 APRIL, 2017.
2. COORDINATES ARE UNIVERSAL TRANSVERSE MERCATOR (UTM), ZONE 16 NORTH, NORTH AMERICAN DATUM 1983 (NAD83).
3. WATER LEVELS MEASURED BY IEA/MWH JV PERSONNEL ON 2, 3 OCTOBER, 2018.
4. MONITORING WELLS USED TO CREATE THE WATER TABLE MAP ARE SHOWN WITH ELEVATIONS.
5. MW105, MW107 AND MW649 ARE COMBINATION OVERBURDEN/BEDROCK WELLS USED AS HORIZONTAL CONTROL POINTS.

north

Drawn By & Date: TMM 11/16/2018 | Approved By & Date: RJR 11/16/2018 | Revised By & Date: 11/16/2018 | Approved By & Date:

TMM DEVELOPED BY | TMM DRAWN BY | 11/16/2018 DATE | APPROVED BY

CONTRACT NO. W912QR-15-C-0016

VERIFY SCALE 0 1/2 1
BAR REPRESENTS ONE INCH ON ORIGINAL
SCALE 1" = 300'

REV	DATE	BY	DESCRIPTION

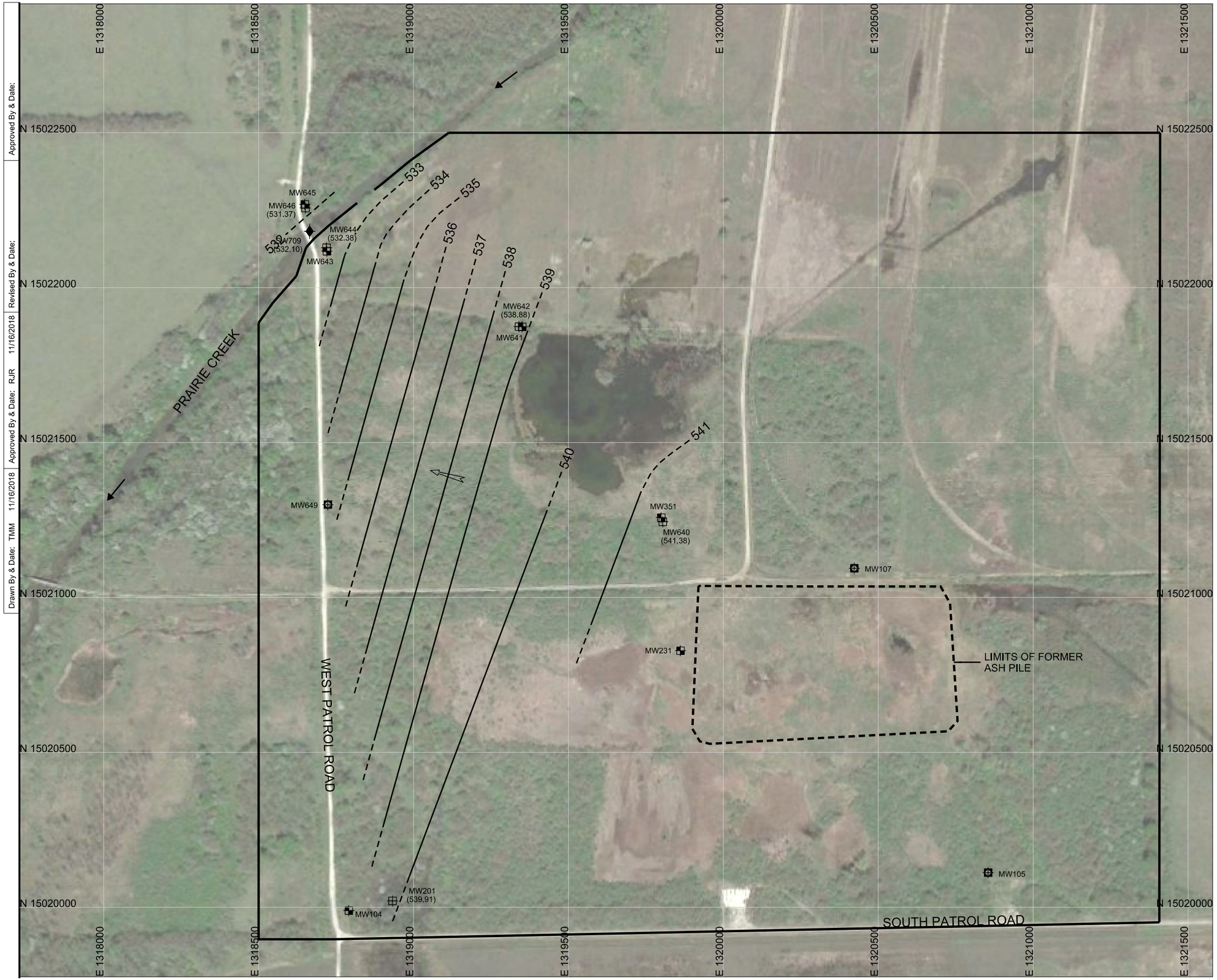
SITE FEATURES/WATER TABLE MAP - MFG AREA
SITE M1
(OCTOBER 2018)

2018 ANNUAL GROUNDWATER MONITORING REPORT
JOLIET ARMY AMMUNITION PLANT
WILL COUNTY, ILLINOIS

PRINTED 11/16/2018

FIGURE 3-13
DRAWING NUMBER

IEA MWH
JOINT VENTURE



LEGEND:

- MW104 — OVERBURDEN MONITORING WELL LOCATION AND NUMBER.
- MW649 — COMBINED MONITORING WELL LOCATION AND NUMBER.
- MW642 (538.88) — BEDROCK MONITORING WELL LOCATION, NUMBER AND POTENTIOMETRIC SURFACE ELEVATION.
- SW709 (532.10) — SURFACE WATER MONITORING LOCATION, NUMBER, AND SURFACE WATER ELEVATION.
- 540 — POTENTIOMETRIC SURFACE CONTOUR (CONTOUR INTERVAL: 1 FT) (DASHED WHERE INFERRED)
- DIRECTION OF BEDROCK FLOW
- DIRECTION OF FLOW IN CREEK
- GROUNDWATER MANAGEMENT ZONE BOUNDARY

NOTES:

1. BASE MAP DEVELOPED FROM AN AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH, DATED 22 APRIL, 2017.
2. COORDINATES ARE UNIVERSAL TRANSVERSE MERCATOR (UTM), ZONE 16 NORTH, NORTH AMERICAN DATUM 1983 (NAD83).
3. WATER LEVELS MEASURED BY IEA/MWH JV PERSONNEL ON 2, 3 OCTOBER, 2018.
4. MONITORING WELLS USED TO CREATE THE POTENTIOMETRIC SURFACE MAP ARE SHOWN WITH ELEVATIONS.

north

Drawn By & Date: TMM 11/16/2018 | Approved By & Date: RJR 11/16/2018 | Revised By & Date: 11/16/2018 | Approved By & Date:

TMM DEVELOPED BY | TMM DRAWN BY | 11/16/2018 DATE | CONTRACT NO. W912QR-15-C-0016

VERIFY SCALE 0 1/2 1 — BAR REPRESENTS ONE INCH ON ORIGINAL — SCALE 1" = 300'

REV	DATE	BY	DESCRIPTION

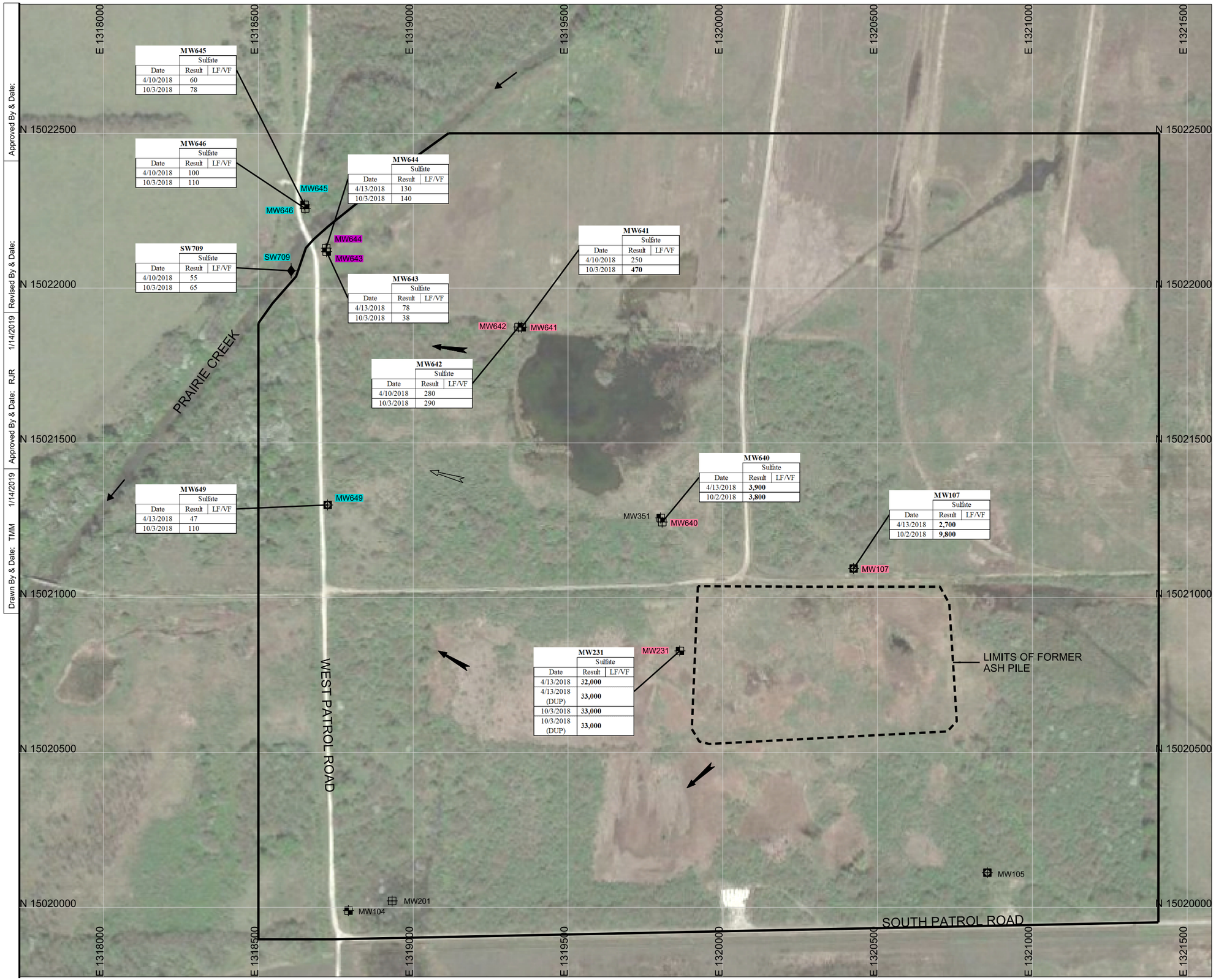
POTENTIOMETRIC SURFACE MAP - MFG AREA
SITE M1
(OCTOBER 2018)

2018 ANNUAL GROUNDWATER MONITORING REPORT
JOLIET ARMY AMMUNITION PLANT
WILL COUNTY, ILLINOIS

PRINTED 11/16/2018

FIGURE 3-14
DRAWING NUMBER

IEA MWH
JOINT VENTURE



MW645	Sulfate	
Date	Result	LF/VF
4/10/2018	60	
10/3/2018	78	

MW646	Sulfate	
Date	Result	LF/VF
4/10/2018	100	
10/3/2018	110	

MW644	Sulfate	
Date	Result	LF/VF
4/13/2018	130	
10/3/2018	140	

SW709	Sulfate	
Date	Result	LF/VF
4/10/2018	55	
10/3/2018	65	

MW643	Sulfate	
Date	Result	LF/VF
4/13/2018	78	
10/3/2018	38	

MW641	Sulfate	
Date	Result	LF/VF
4/10/2018	250	
10/3/2018	**470**	

MW642	Sulfate	
Date	Result	LF/VF
4/10/2018	280	
10/3/2018	290	

MW640	Sulfate	
Date	Result	LF/VF
4/13/2018	**3,900**	
10/2/2018	**3,800**	

MW649	Sulfate	
Date	Result	LF/VF
4/13/2018	47	
10/3/2018	110	

MW107	Sulfate	
Date	Result	LF/VF
4/13/2018	**2,700**	
10/2/2018	**9,800**	

MW231	Sulfate	
Date	Result	LF/VF
4/13/2018	**32,000**	
4/13/2018 (DUP)	**33,000**	
10/3/2018	**33,000**	
10/3/2018 (DUP)	**33,000**	

LEGEND:

- MW107 — OVERBURDEN MONITORING WELL LOCATION, NUMBER, AND SULFATE DETECTION.
- MW649 — COMBINED MONITORING WELL LOCATION, NUMBER, AND SULFATE DETECTION.
- MW642 — BEDROCK MONITORING WELL LOCATION, NUMBER AND SULFATE DETECTION.
- SW709 — SURFACE WATER MONITORING LOCATION, NUMBER, AND SULFATE DETECTION.
- DIRECTION OF WATER TABLE FLOW
- DIRECTION OF BEDROCK FLOW
- DIRECTION OF FLOW IN CREEK
- GROUNDWATER MANAGEMENT ZONE BOUNDARY
- DUP — DUPLICATE
- LF/VF — LAB FLAG/VALIDATION FLAG
- mg/L — MILLIGRAMS PER LITER
- RG — REMEDIATION GOAL
- IN-PLUME MONITORING POINT
- EARLY WARNING MONITORING POINT
- COMPLIANCE MONITORING POINT

COMPOUND (mg/L)	PROJECT ACTION LIMIT	SURFACE WATER RG
SULFATE	400	500

NOTES:

1. PROJECT ACTION LIMITS ARE THE REMEDIAL GOALS AS SPECIFIED IN TABLE 6-2 OF THE 1998 RECORD OF DECISION. WHERE NO RG IS PRESENTED IN THE 1998 RECORD OF DECISION, THE PROJECT ACTION LIMIT IS OBTAINED FROM IEPA CLASS II GROUNDWATER STANDARDS.
2. THE SURFACE WATER PROJECT ACTION LIMITS ARE OBTAINED FROM TABLE 10-1 OF THE 1998 RECORD OF DECISION.
3. BASE MAP DEVELOPED FROM AN AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH, DATED 22 APRIL, 2017.
4. COORDINATES ARE UNIVERSAL TRANSVERSE MERCATOR (UTM), ZONE 16 NORTH, NORTH AMERICAN DATUM 1983 (NAD83).
5. SAMPLES COLLECTED BY IEA/MWH JV PERSONNEL ON 10, 13 APRIL AND 2, 3 OCTOBER, 2018.
6. CONCENTRATIONS REPORTED IN MILLIGRAMS PER LITER (mg/L).
7. BOLDED VALUE INDICATES RG EXCEEDANCE.

north

Drawn By & Date: TMM 1/14/2019 | Approved By & Date: RJR 1/14/2019 | Revised By & Date: | Approved By & Date:

TMM — DEVELOPED BY
TMM — DRAWN BY
1/14/2019 — DATE
APPROVED BY

CONTRACT NO. W912QR-15-C-0016

VERIFY SCALE
0 1/2 1
BAR REPRESENTS ONE INCH ON ORIGINAL
SCALE 1" = 300'

REV	DATE	BY	DESCRIPTION

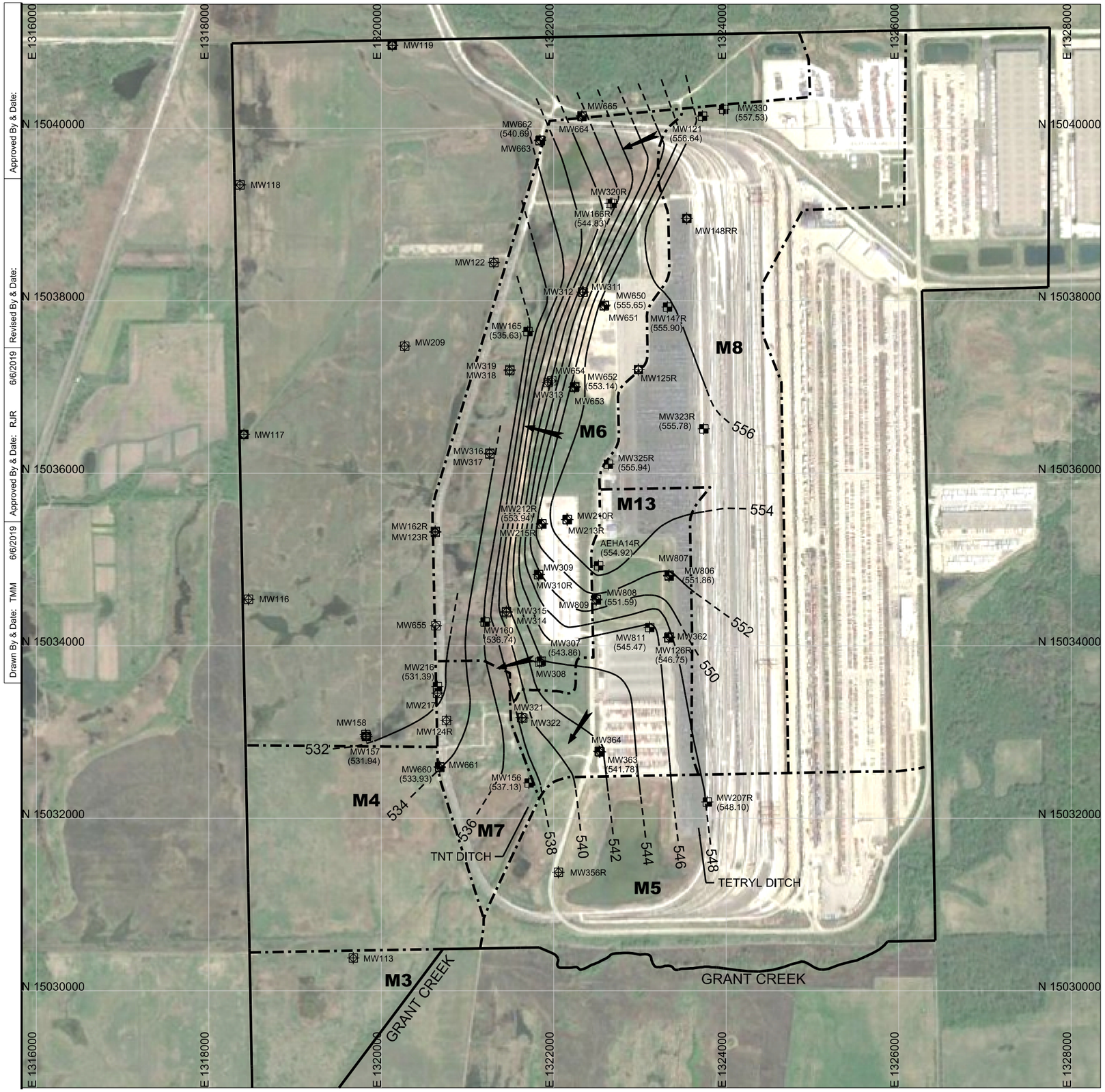
SULFATE DETECTIONS - MFG AREA
SITE M1
(APRIL / OCTOBER 2018)

2018 ANNUAL GROUNDWATER MONITORING REPORT
JOLIET ARMY AMMUNITION PLANT
WILL COUNTY, ILLINOIS

PRINTED 1/14/2019

FIGURE 3-15
DRAWING NUMBER

IEA MWH
JOINT VENTURE



LEGEND:

- MW330 (557.53) — OVERBURDEN MONITORING WELL LOCATION, NUMBER, AND WATER TABLE ELEVATION.
- MW157 (531.94) — COMBINED MONITORING WELL LOCATION, NUMBER, AND WATER TABLE ELEVATION.
- MW118 — SHALLOW BEDROCK MONITORING WELL LOCATION AND NUMBER.
- MW665 — DEEPER BEDROCK MONITORING WELL LOCATION AND NUMBER.
- 550 — WATER TABLE CONTOUR (CONTOUR INTERVAL: 2 FT) (DASHED WHERE INFERRED)
- DIRECTION OF WATER TABLE FLOW
- GROUNDWATER MANAGEMENT ZONE BOUNDARY
- STUDY AREA BOUNDARIES

NOTES:

1. BASE MAP DEVELOPED FROM AN AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH, DATED 22 APRIL, 2017.
2. COORDINATES ARE UNIVERSAL TRANSVERSE MERCATOR (UTM), ZONE 16 NORTH, NORTH AMERICAN DATUM 1983 (NAD83).
3. WATER LEVELS MEASURED BY IEA/MWH JV PERSONNEL ON 8, 9 OCTOBER, 2018.
4. MONITORING WELLS USED TO CREATE THE WATER TABLE MAP ARE SHOWN WITH ELEVATIONS.
5. SELECT COMBINATION OVERBURDEN/BEDROCK WELLS ARE USED AS HORIZONTAL CONTROL POINTS.

north

Drawn By & Date: TMM 6/6/2019
Approved By & Date: RJR 6/6/2019
Revised By & Date:
Approved By & Date:

TMM DEVELOPED BY
TMM DRAWN BY
6/6/2019 DATE
CONTRACT NO. W912QR-15-C-0016

VERIFY SCALE
0 1/2 1
BAR REPRESENTS ONE INCH ON ORIGINAL
SCALE 1" = 1200'

REV	DATE	BY	DESCRIPTION

SITE FEATURES/WATER TABLE MAP - MFG AREA
SITES M3, M4, M5, M6, M7, M8, M13 AND OTHER AREAS (OCTOBER 2018)

2018 ANNUAL GROUNDWATER MONITORING REPORT
JOLIET ARMY AMMUNITION PLANT
WILL COUNTY, ILLINOIS

PRINTED 6/6/2019

FIGURE 3-16
DRAWING NUMBER

IEA MWH
JOINT VENTURE

LEGEND:

- MW330 — OVERBURDEN MONITORING WELL LOCATION AND NUMBER.
- MW119 (532.89) — COMBINED MONITORING WELL LOCATION AND NUMBER.
- MW118 (530.78) — SHALLOW BEDROCK MONITORING WELL LOCATION, NUMBER AND POTENTIOMETRIC SURFACE ELEVATION.
- MW665 (542.44) — DEEPER BEDROCK MONITORING WELL LOCATION, NUMBER AND POTENTIOMETRIC SURFACE ELEVATION.
- 544 — POTENTIOMETRIC SURFACE CONTOUR (CONTOUR INTERVAL: 2 FT) (DASHED WHERE INFERRED)
- DIRECTION OF BEDROCK FLOW
- GROUNDWATER MANAGEMENT ZONE BOUNDARY
- STUDY AREA BOUNDARIES

NOTES:

1. BASE MAP DEVELOPED FROM AN AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH, DATED 22 APRIL, 2017.
2. COORDINATES ARE UNIVERSAL TRANSVERSE MERCATOR (UTM), ZONE 16 NORTH, NORTH AMERICAN DATUM 1983 (NAD83).
3. WATER LEVELS MEASURED BY IEA/MWH JV PERSONNEL ON 8, 9 OCTOBER, 2018.
4. MONITORING WELLS USED TO CREATE THE POTENTIOMETRIC SURFACE MAP ARE SHOWN WITH ELEVATIONS.
5. SELECT COMBINATION OVERBURDEN/BEDROCK WELLS ARE USED AS HORIZONTAL CONTROL POINTS.

north

Drawn By & Date: TMM 6/6/2019 | Approved By & Date: RJR 6/6/2019 | Revised By & Date: | Approved By & Date:

TMM — DEVELOPED BY | TMM — DRAWN BY | 6/6/2019 — DATE | APPROVED BY

CONTRACT NO. W912QR-15-C-0016

VERIFY SCALE — 0 1/2 1

BAR REPRESENTS ONE INCH ON ORIGINAL

SCALE 1" = 1200'

REV	DATE	BY	DESCRIPTION

POTENTIOMETRIC SURFACE MAP - MFG AREA SITES M3, M4, M5, M6, M7, M8, M13 AND OTHER AREAS (OCTOBER 2018)

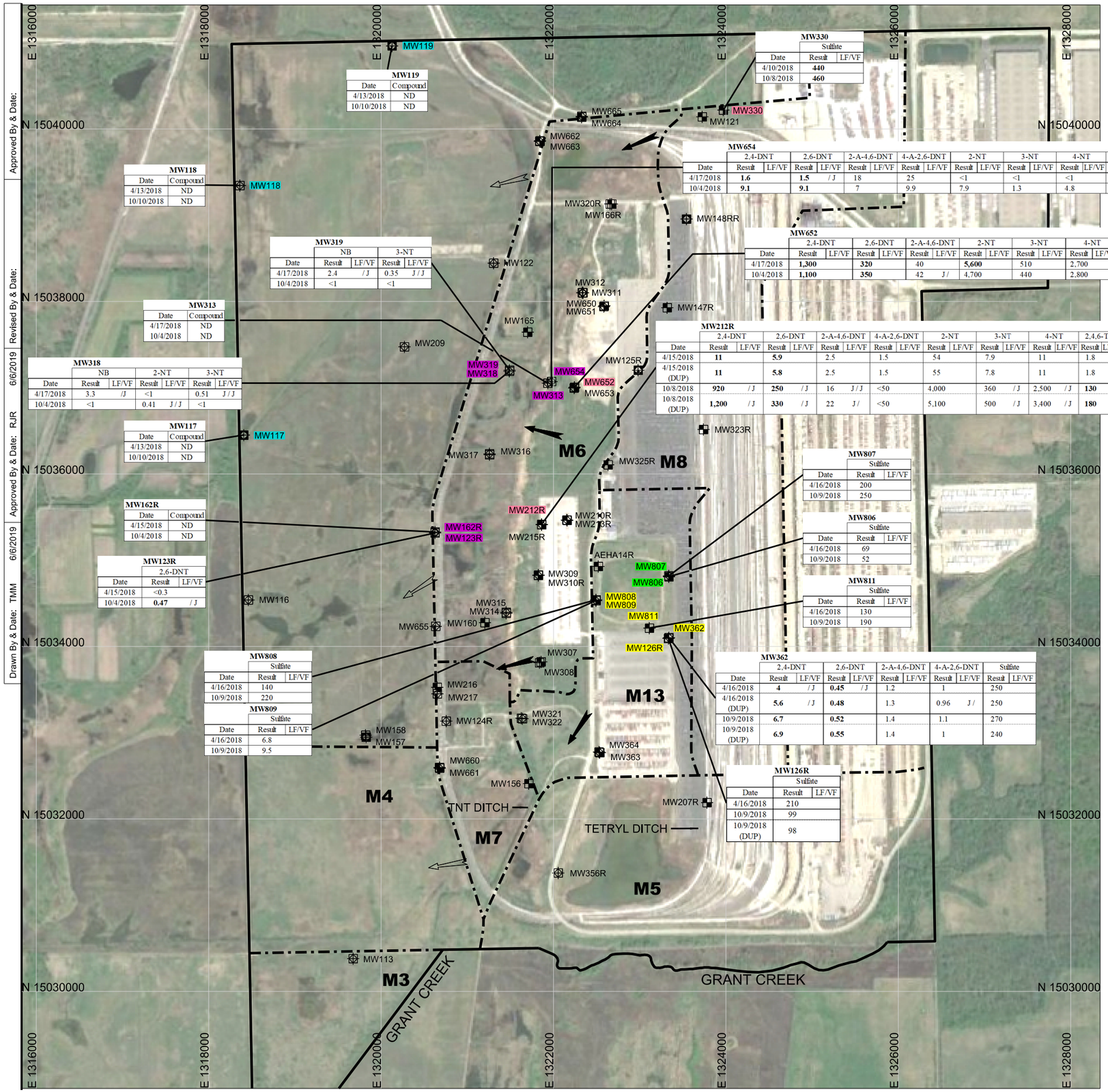
2018 ANNUAL GROUNDWATER MONITORING REPORT
JOLIET ARMY AMMUNITION PLANT
WILL COUNTY, ILLINOIS

PRINTED 6/6/2019

FIGURE 3-17

DRAWING NUMBER

IEA MWH JOINT VENTURE



MW119

Date	Compound
4/13/2018	ND
10/10/2018	ND

MW118

Date	Compound
4/13/2018	ND
10/10/2018	ND

MW313

Date	Compound
4/17/2018	ND
10/4/2018	ND

MW117

Date	Compound
4/13/2018	ND
10/10/2018	ND

MW162R

Date	Compound
4/15/2018	ND
10/4/2018	ND

MW123R

Date	2,6-DNT Result	LF/VF
4/15/2018	<0.3	
10/4/2018	**0.47**	/ J

MW330

Date	Sulfate Result	LF/VF
4/10/2018	**440**	
10/8/2018	**460**	

MW654

Date	2,4-DNT Result	LF/VF	2,6-DNT Result	LF/VF	2-A-4,6-DNT Result	LF/VF	4-A-2,6-DNT Result	LF/VF	2-NT Result	LF/VF	3-NT Result	LF/VF	4-NT Result	LF/VF	Tetryl Result	LF/VF	2,4,6-TNT Result	LF/VF
4/17/2018	**1.6**		**1.5**	/ J	18		25		<1		<1		<1		<1		3.4	
10/4/2018	**9.1**		**9.1**		7		9.9		7.9		1.3		4.8		0.51	J /	<1	

MW319

Date	NB Result	LF/VF	3-NT Result	LF/VF
4/17/2018	2.4	/ J	0.35	J / J
10/4/2018	<1		<1	

MW652

Date	2,4-DNT Result	LF/VF	2,6-DNT Result	LF/VF	2-A-4,6-DNT Result	LF/VF	2-NT Result	LF/VF	3-NT Result	LF/VF	4-NT Result	LF/VF	2,4,6-TNT Result	LF/VF
4/17/2018	**1,300**		**320**		40		**5,600**		510		2,700		**170**	
10/4/2018	**1,100**		**350**		42	J /	4,700		440		2,800		**150**	

MW318

Date	NB Result	LF/VF	2-NT Result	LF/VF	3-NT Result	LF/VF
4/17/2018	3.3	/J	<1		0.51	J / J
10/4/2018	<1		0.41	J / J	<1	

MW212R

Date	2,4-DNT Result	LF/VF	2,6-DNT Result	LF/VF	2-A-4,6-DNT Result	LF/VF	4-A-2,6-DNT Result	LF/VF	2-NT Result	LF/VF	3-NT Result	LF/VF	4-NT Result	LF/VF	2,4,6-TNT Result	LF/VF
4/15/2018	**11**		**5.9**		2.5		1.5		54		7.9		11		1.8	
4/15/2018 (DUP)	**11**		**5.8**		2.5		1.5		55		7.8		11		1.8	
10/8/2018	**920**	/ J	**250**	/ J	16	J / J	<50		4,000		360	/ J	2,500	/ J	**130**	
10/8/2018 (DUP)	**1,200**	/ J	**330**	/ J	22	J /	<50		5,100		500	/ J	3,400	/ J	**180**	

MW807

Date	Sulfate Result	LF/VF
4/16/2018	200	
10/9/2018	250	

MW806

Date	Sulfate Result	LF/VF
4/16/2018	69	
10/9/2018	52	

MW811

Date	Sulfate Result	LF/VF
4/16/2018	130	
10/9/2018	190	

MW808

Date	Sulfate Result	LF/VF
4/16/2018	140	
10/9/2018	220	

MW809

Date	Sulfate Result	LF/VF
4/16/2018	6.8	
10/9/2018	9.5	

MW362

Date	2,4-DNT Result	LF/VF	2,6-DNT Result	LF/VF	2-A-4,6-DNT Result	LF/VF	4-A-2,6-DNT Result	LF/VF	Sulfate Result	LF/VF
4/16/2018	**4**	/ J	**0.45**	/ J	1.2		1		250	
4/16/2018 (DUP)	**5.6**	/ J	**0.48**		1.3		0.96	J /	250	
10/9/2018	**6.7**		**0.52**		1.4		1.1		270	
10/9/2018 (DUP)	**6.9**		**0.55**		1.4		1		240	

MW126R

Date	Sulfate Result	LF/VF
4/16/2018	210	
10/9/2018	99	
10/9/2018 (DUP)	98	

LEGEND:

- MW330 — OVERBURDEN MONITORING WELL LOCATION, NUMBER, AND EXPLOSIVES OR SULFATE DETECTIONS.
- MW119 — COMBINED MONITORING WELL LOCATION, NUMBER, AND EXPLOSIVES OR SULFATE DETECTIONS.
- MW118 — SHALLOW BEDROCK MONITORING WELL LOCATION, NUMBER AND EXPLOSIVES OR SULFATE DETECTIONS.
- MW319 — DEEPER BEDROCK MONITORING WELL LOCATION, NUMBER AND EXPLOSIVES OR SULFATE DETECTIONS.
- DIRECTION OF WATER TABLE FLOW
- DIRECTION OF BEDROCK FLOW
- GROUNDWATER MANAGEMENT ZONE BOUNDARY
- STUDY AREA BOUNDARIES
- IN-PLUME MONITORING POINT
- EARLY WARNING MONITORING POINT
- COMPLIANCE MONITORING POINT
- DOWNGRADIENT MONITORING POINT
- UPGRADIENT MONITORING POINT

2,4,6-TNT	2,4,6-TRINITROTOLUENE
2,4-DNT	2,4-DINITROTOLUENE
2,6-DNT	2,6-DINITROTOLUENE
2-A-4,6-DNT	2-AMINO-4,6-DINITROTOLUENE
4-A-2,6-DNT	4-AMINO-2,6-DINITROTOLUENE
2-NT	2-NITROTOLUENE
3-NT	3-NITROTOLUENE
4-NT	4-NITROTOLUENE
NB	NITROBENZENE
TETRYL	2,4,6-TRINITROPHENYLMETHYLNITRAMINE
DUP	DUPLICATE
LF/VF	LAB FLAG/VALIDATION FLAG
J	ESTIMATED CONCENTRATION
µg/L	MICROGRAMS PER LITER
mg/L	MILLIGRAMS PER LITER
ND	NOT DETECTED
NS	NO STANDARD
RG	REMEDIATION GOAL

COMPOUND (µg/L)	PROJECT ACTION LIMIT
2,4,6-TNT	9.5
2,4-DNT	0.42
2,6-DNT	0.42
2-A-4,6-DNT	NS
4-A-2,6-DNT	NS
2-NT	5,100
3-NT	NS
4-NT	NS
NB	51
TETRYL	200
SULFATE (mg/L)	400

NOTES:

1. PROJECT ACTION LIMITS ARE THE REMEDIAL GOALS AS SPECIFIED IN TABLE 6-2 OF THE 1998 RECORD OF DECISION. WHERE NO RG IS PRESENTED IN THE 1998 RECORD OF DECISION, THE PROJECT ACTION LIMIT IS OBTAINED FROM IEPA CLASS II GROUNDWATER STANDARDS.
2. BASE MAP DEVELOPED FROM AN AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH, DATED 22 APRIL, 2017.
3. COORDINATES ARE UNIVERSAL TRANSVERSE MERCATOR (UTM), ZONE 16 NORTH, NOTRH AMERICAN DATUM 1983 (NAD83).
4. SAMPLES COLLECTED BY IEA/MWH JV PERSONNEL ON 10, 13, 15, 16, AND 17 APRIL, AND 4, 8, 9, AND 10 OCTOBER, 2018.
5. CONCENTRATIONS REPORTED IN MICROGRAMS PER LITER (µg/L) WITH THE EXCEPTION OF SULFATE, REPORTED IN MILLIGRAMS PER LITER (mg/L).
6. BOLDED VALUE INDICATES RG EXCEEDANCE.

north

Approved By & Date:
Revised By & Date:
6/6/2019
Approved By & Date: RJR
6/6/2019
Drawn By & Date: TMM

TMM DEVELOPED BY
TMM DRAWN BY
APPROVED BY
6/6/2019 DATE
CONTRACT NO. W912QR-15-C-0016

VERIFY SCALE
BAR REPRESENTS ONE INCH ON ORIGINAL
SCALE 1" = 1200'

REV	DATE	BY	DESCRIPTION

EXPLOSIVES AND SULFATE DETECTIONS - MFG AREA SITES M6, M8, M13 AND OTHER AREAS (APRIL / OCTOBER 2018)

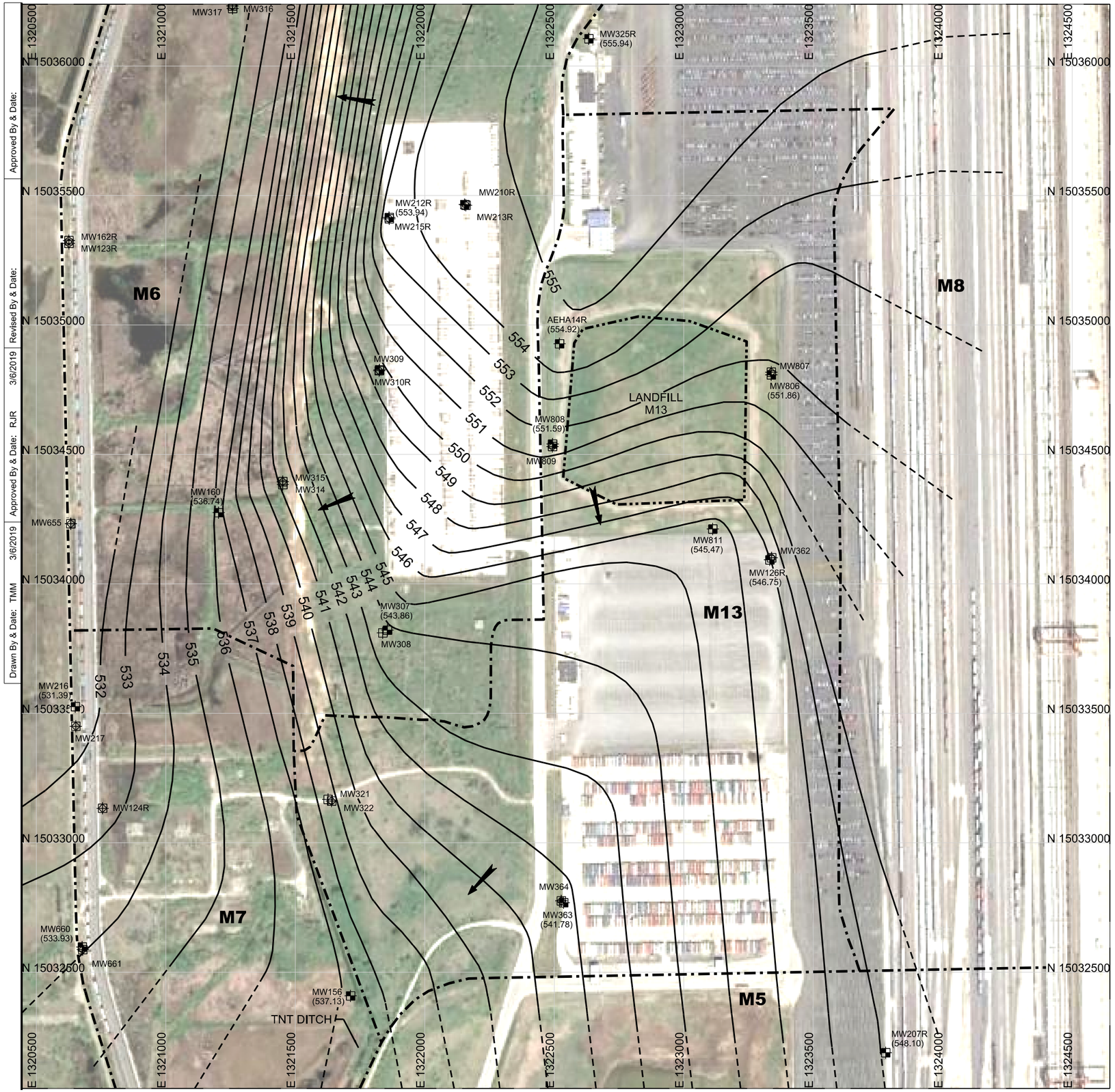
2018 ANNUAL GROUNDWATER MONITORING REPORT
JOLIET ARMY AMMUNITION PLANT
WILL COUNTY, ILLINOIS

PRINTED 6/6/2019

FIGURE 3-18

DRAWING NUMBER

IEA MWH JOINT VENTURE



LEGEND:

- MW126R (546.75) OVERBURDEN MONITORING WELL LOCATION, NUMBER, AND WATER TABLE ELEVATION.
- MW362 COMBINED MONITORING WELL LOCATION AND NUMBER.
- MW321 SHALLOW BEDROCK MONITORING WELL LOCATION AND NUMBER.
- MW807 DEEPER BEDROCK MONITORING WELL LOCATION AND NUMBER.
- 550 WATER TABLE CONTOUR (CONTOUR INTERVAL: 1 FT) (DASHED WHERE INFERRED)
- DIRECTION OF WATER TABLE FLOW
- STUDY AREA BOUNDARIES
- APPROXIMATE LIMITS OF LANDFILL

NOTES:

1. BASE MAP DEVELOPED FROM AN AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH, DATED 22 APRIL, 2017.
2. COORDINATES ARE UNIVERSAL TRANSVERSE MERCATOR (UTM), ZONE 16 NORTH, NORTH AMERICAN DATUM 1983 (NAD83).
3. SEE FIGURE 3-16 FOR WATER TABLE ELEVATIONS AND CONFIGURATION OF AREA SURROUNDING LANDFILL M13.
4. WATER LEVELS MEASURED BY IEA/MWH JV PERSONNEL ON 8 AND 9 OCTOBER, 2018.
5. MONITORING WELLS USED TO CREATE THE WATER TABLE MAP ARE SHOWN WITH ELEVATIONS.
6. SELECT COMBINATION OVERBURDEN/BEDROCK WELLS ARE USED AS HOIZONTAL CONTROL POINTS.
7. APPROXIMATE LIMITS OF LANDFILL OBTAINED FROM A DRAWING, "M13 NEW WELL LOCATIONS", FIGURE 1, PROJECT NO. 7-61M-11686, PREPARED BY AMEC EARTH & ENVIRONMENTAL, DATED MAY 2008.

north

Approved By & Date:
Revised By & Date:
Approved By & Date: RJR 3/6/2019
Drawn By & Date: TMM 3/6/2019

TMM DEVELOPED BY
TMM DRAWN BY
APPROVED BY
3/6/2019 DATE

CONTRACT NO. W912QR-15-C-0016

VERIFY SCALE
0 1/2 1
BAR REPRESENTS ONE INCH ON ORIGINAL
SCALE 1" = 400'

REV	DATE	BY	DESCRIPTION

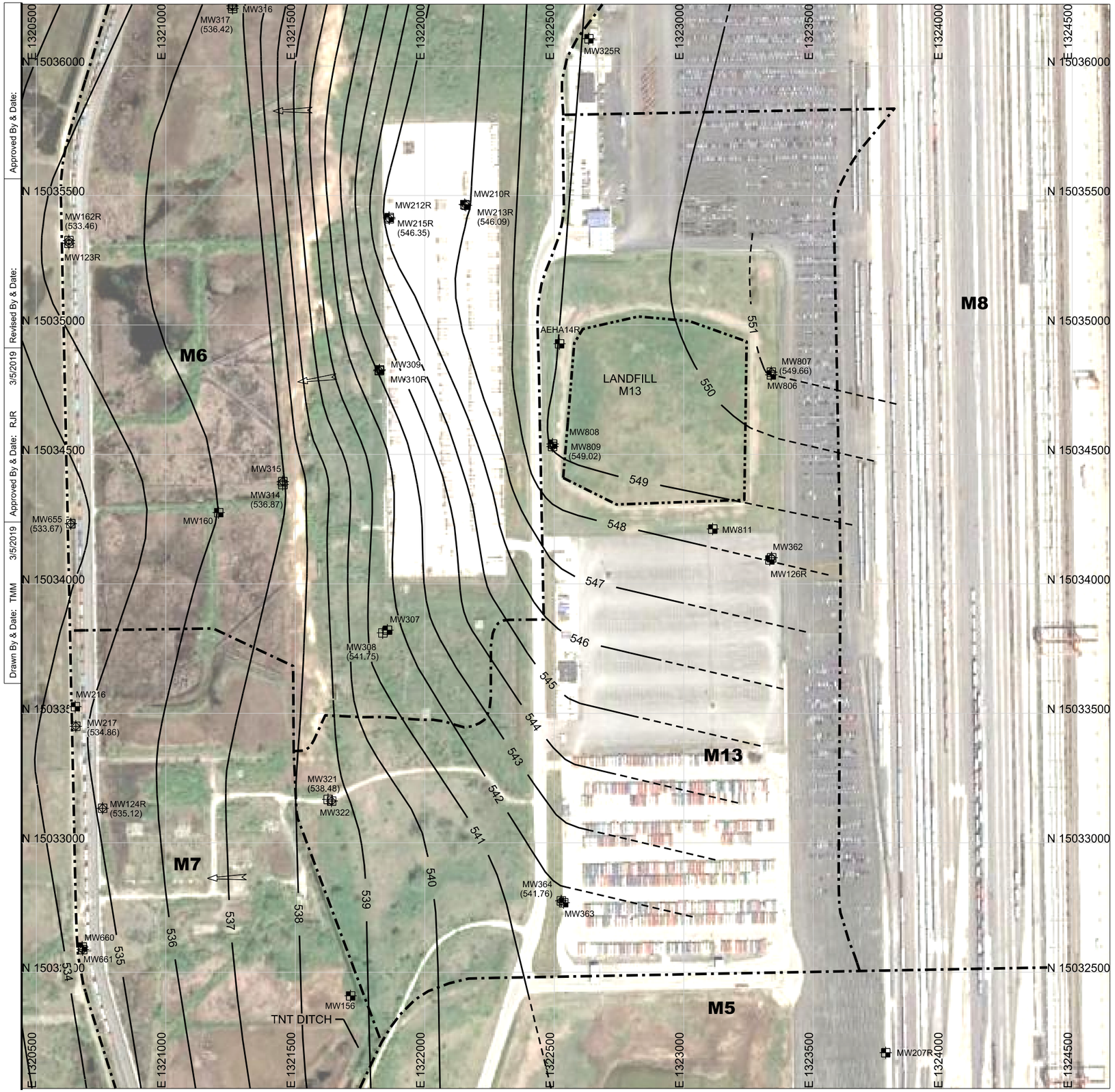
SITE FEATURES/WATER TABLE MAP - MFG AREA
SITE M13 LANDFILL
(OCTOBER 2018)

2018 ANNUAL GROUNDWATER MONITORING REPORT
JOLIET ARMY AMMUNITION PLANT
WILL COUNTY, ILLINOIS

PRINTED
3/6/2019

FIGURE 3-19
DRAWING NUMBER

IEA MWH
JOINT VENTURE



LEGEND:

- MW126R — OVERBURDEN MONITORING WELL LOCATION AND NUMBER.
- MW362 — COMBINED MONITORING WELL LOCATION AND NUMBER.
- MW321 — SHALLOW BEDROCK MONITORING WELL LOCATION AND NUMBER.
- MW807 (549.66) — DEEPER BEDROCK MONITORING WELL LOCATION, NUMBER AND POTENTIOMETRIC SURFACE ELEVATION.
- 540 — POTENTIOMETRIC SURFACE CONTOUR (CONTOUR INTERVAL: 1 FT) (DASHED WHERE INFERRED)
- DIRECTION OF BEDROCK FLOW
- STUDY AREA BOUNDARIES
- APPROXIMATE LIMITS OF LANDFILL

NOTES:

1. BASE MAP DEVELOPED FROM AN AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH, DATED 22 APRIL, 2017.
2. COORDINATES ARE UNIVERSAL TRANSVERSE MERCATOR (UTM), ZONE 16 NORTH, NORTH AMERICAN DATUM 1983 (NAD83).
3. SEE FIGURE 3-17 FOR POTENTIOMETRIC SURFACE ELEVATIONS AND CONFIGURATION OF AREA SURROUNDING LANDFILL M13.
4. WATER LEVELS MEASURED BY IEA/MWH JV PERSONNEL ON 8 AND 9 OCTOBER, 2018.
5. MONITORING WELLS USED TO CREATE THE POTENTIOMETRIC SURFACE MAP ARE SHOWN WITH ELEVATIONS.
6. SELECT COMBINATION OVERBURDEN/BEDROCK WELLS ARE USED AS HORIZONTAL CONTROL POINTS.
7. APPROXIMATE LIMITS OF LANDFILL OBTAINED FROM A DRAWING, "M13 NEW WELL LOCATIONS", FIGURE 1, PROJECT NO. 7-61M-11686, PREPARED BY AMEC EARTH & ENVIRONMENTAL, DATED MAY2008.

north

Approved By & Date:
Revised By & Date:
Approved By & Date: RJR 3/5/2019
Drawn By & Date: TMM 3/5/2019

TMM DEVELOPED BY
TMM DRAWN BY
3/5/2019 DATE
APPROVED BY
CONTRACT NO. W912QR-15-C-0016

VERIFY SCALE
0 1/2 1
BAR REPRESENTS ONE INCH ON ORIGINAL
SCALE 1" = 400'

REV	DATE	BY	DESCRIPTION

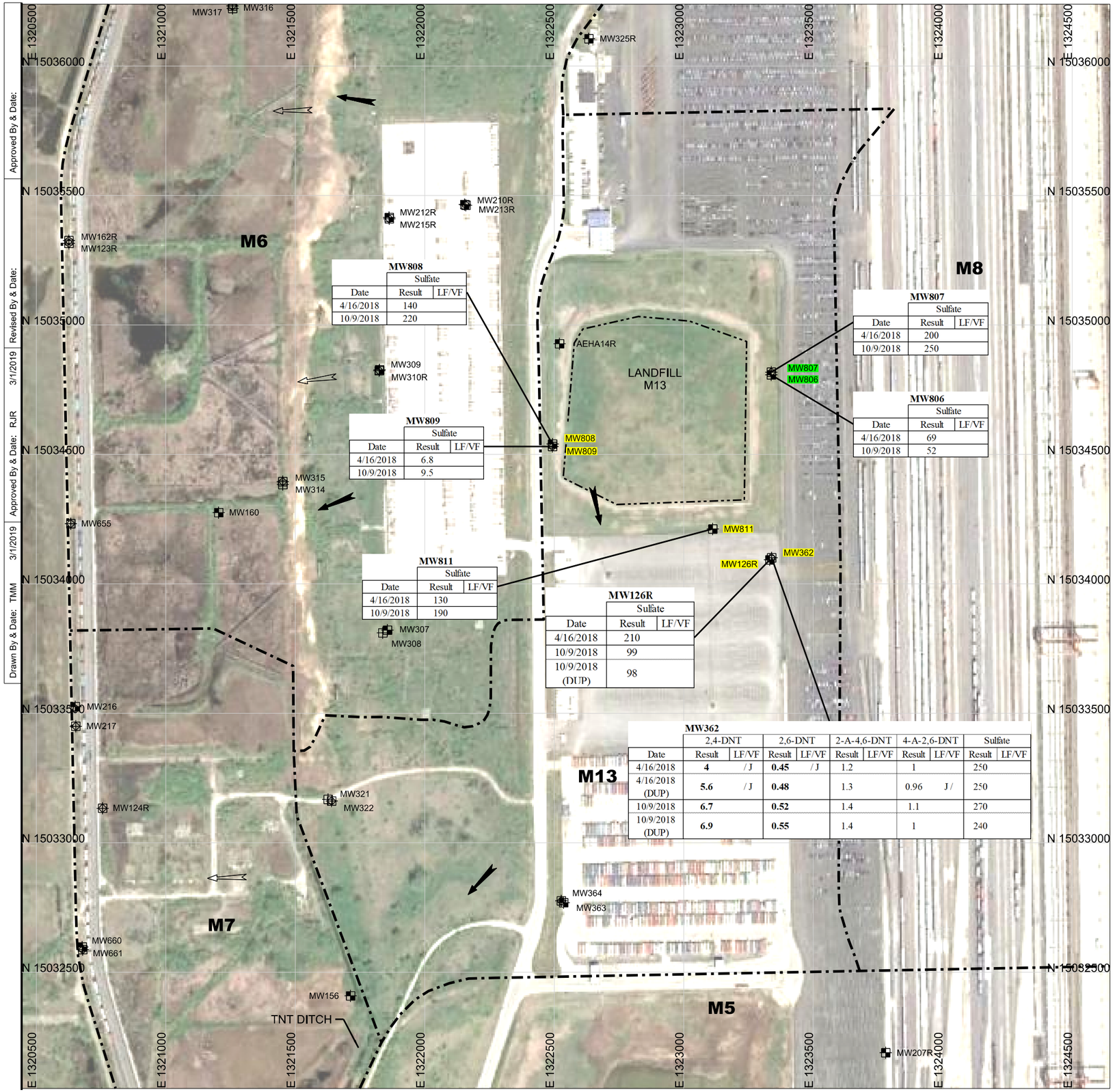
POTENTIOMETRIC SURFACE MAP - MFG AREA
SITE M13 LANDFILL
(OCTOBER 2018)

2018 ANNUAL GROUNDWATER MONITORING REPORT
JOLIET ARMY AMMUNITION PLANT
WILL COUNTY, ILLINOIS

PRINTED
3/5/2019

FIGURE 3-20
DRAWING NUMBER

IEA MWH
JOINT VENTURE



MW808

	Sulfate	
Date	Result	LF/VF
4/16/2018	140	
10/9/2018	220	

MW807

	Sulfate	
Date	Result	LF/VF
4/16/2018	200	
10/9/2018	250	

MW806

	Sulfate	
Date	Result	LF/VF
4/16/2018	69	
10/9/2018	52	

MW809

	Sulfate	
Date	Result	LF/VF
4/16/2018	6.8	
10/9/2018	9.5	

MW811

	Sulfate	
Date	Result	LF/VF
4/16/2018	130	
10/9/2018	190	

MW126R

	Sulfate	
Date	Result	LF/VF
4/16/2018	210	
10/9/2018	99	
10/9/2018 (DUP)	98	

MW362

	2,4-DNT		2,6-DNT		2-A-4,6-DNT		4-A-2,6-DNT		Sulfate	
Date	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF
4/16/2018	**4**	/ J	**0.45**	/ J	1.2		1		250	
4/16/2018 (DUP)	**5.6**	/ J	**0.48**		1.3		0.96	J /	250	
10/9/2018	**6.7**		**0.52**		1.4		1.1		270	
10/9/2018 (DUP)	**6.9**		**0.55**		1.4		1		240	

LEGEND:

- MW126R — OVERBURDEN MONITORING WELL LOCATION, NUMBER, AND EXPLOSIVES AND SULFATE DETECTIONS.
- MW362 — COMBINED MONITORING WELL LOCATION, NUMBER, AND EXPLOSIVES AND SULFATE DETECTIONS.
- MW321 — SHALLOW BEDROCK MONITORING WELL LOCATION AND NUMBER.
- MW807 — DEEPER BEDROCK MONITORING WELL LOCATION, NUMBER, AND EXPLOSIVES AND SULFATE DETECTIONS.
- DIRECTION OF WATER TABLE FLOW
- DIRECTION OF BEDROCK FLOW
- STUDY AREA BOUNDARIES
- APPROXIMATE LIMITS OF LANDFILL
- DOWNGRADIENT MONITORING POINT
- UPGRADIENT MONITORING POINT
- 2,4-DNT — 2,4-DINITROTOLUENE
- 2,6-DNT — 2,6-DINITROTOLUENE
- 2-A-4,6-DNT — 2-AMINO-4,6-DINITROTOLUENE
- 4-A-2,6-DNT — 4-AMINO-2,6-DINITROTOLUENE
- DUP — DUPLICATE
- J — ESTIMATED CONCENTRATION
- LF/VF — LAB FLAG/VALIDATION FLAG
- µg/L — MICROGRAMS PER LITER
- mg/L — MILLIGRAMS PER LITER
- NS — NO STANDARD
- RG — REMEDIATION GOAL

COMPOUND (µg/L)	PROJECT ACTION LIMIT
2,4-DNT	0.42
2,6-DNT	0.42
2-A-4,6-DNT	NS
4-A-2,6-DNT	NS
SULFATE (mg/L)	400

NOTES:

1. PROJECT ACTION LIMITS ARE THE REMEDIAL GOALS AS SPECIFIED IN TABLE 6-2 OF THE 1998 RECORD OF DECISION. WHERE NO RG IS PRESENTED IN THE 1998 RECORD OF DECISION, THE PROJECT ACTION LIMIT IS OBTAINED FROM IEPA CLASS II GROUNDWATER STANDARDS.
2. BASE MAP DEVELOPED FROM AN AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH, DATED 22 APRIL, 2017.
3. COORDINATES ARE UNIVERSAL TRANSVERSE MERCATOR (UTM), ZONE 16 NORTH, NORTH AMERICAN DATUM 1983 (NAD83).
4. SAMPLES COLLECTED BY IEA/MWH JV PERSONNEL ON 16 APRIL AND 9 OCTOBER, 2018.
5. CONCENTRATIONS REPORTED IN MICROGRAMS PER LITER (µg/L) WITH THE EXCEPTION OF SULFATE, REPORTED IN MILLIGRAMS PER LITER (mg/L).
6. BOLDED VALUE INDICATES RG EXCEEDANCE.
7. APPROXIMATE LIMITS OF LANDFILL OBTAINED FROM A DRAWING, "M13 NEW WELL LOCATIONS", FIGURE 1, PROJECT NO. 7-61M-11686, PREPARED BY AMEC EARTH & ENVIRONMENTAL, DATED MAY 2008.

north

Approved By & Date:
Revised By & Date:
Approved By & Date: RJR 3/1/2019
Drawn By & Date: TMM 3/1/2019

TMM DEVELOPED BY | TMM DRAWN BY | 3/1/2019 DATE | APPROVED BY | CONTRACT NO. W912QR-15-C-0016

VERIFY SCALE — BAR REPRESENTS ONE INCH ON ORIGINAL — SCALE 1" = 400'

REV	DATE	BY	DESCRIPTION

EXPLOSIVES AND SULFATE DETECTIONS - MFG AREA SITE M13 LANDFILL (APRIL / OCTOBER 2018)

2018 ANNUAL GROUNDWATER MONITORING REPORT
JOLIET ARMY AMMUNITION PLANT
WILL COUNTY, ILLINOIS

PRINTED 3/1/2019

FIGURE 3-21

DRAWING NUMBER

IEA MWH JOINT VENTURE

LEGEND:

- MW802 (533.72) — COMBINED MONITORING WELL LOCATION, NUMBER, AND WATER TABLE ELEVATION.
- MW335 (529.52) — SHALLOW BEDROCK MONITORING WELL LOCATION, NUMBER AND WATER TABLE ELEVATION.
- 532 — POTENTIOMETRIC SURFACE CONTOUR (CONTOUR INTERVAL: 1 FT) (DASHED WHERE INFERRED)
- DIRECTION OF SHALLOW BEDROCK FLOW
- DIRECTION OF FLOW IN CREEK
- STUDY AREA BOUNDARY
- APPROXIMATE LIMITS OF LANDFILL

NOTES:

1. BASE MAP DEVELOPED FROM AN AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH, DATED 22 APRIL, 2017.
2. COORDINATES ARE UNIVERSAL TRANSVERSE MERCATOR (UTM), ZONE 16 NORTH, NORTH AMERICAN DATUM 1983 (NAD 83).
3. WATER LEVELS MEASURED BY IEA/MWH JV PERSONNEL ON 2 OCTOBER, 2018.
4. MONITORING WELLS USED TO CREATE THE WATER TABLE MAP ARE SHOWN WITH ELEVATIONS.
5. APPROXIMATE LIMITS OF LANDFILL OBTAINED FROM A DRAWING, "M11 NEW WELL LOCATIONS", PROJECT NO. 7-61M-11656, PREPARED BY AMEC EARTH & ENVIRONMENTAL, DATED JANUARY 2008.
6. MW802 IS A COMBINATION OVERBURDEN/BEDROCK WELL USED AS A HORIZONTAL CONTROL POINT.

north

Drawn By & Date: TMM 3/1/2019	Approved By & Date: RJR 3/1/2019	Revised By & Date: 3/1/2019	Approved By & Date:

TMM — DEVELOPED BY
TMM — DRAWN BY
3/1/2019 — DATE
APPROVED BY
CONTRACT NO. W912QR-15-C-0016

VERIFY SCALE
0 1/2 1
BAR REPRESENTS ONE INCH ON ORIGINAL
SCALE 1" = 500'

REV	DATE	BY	DESCRIPTION

SHALLOW POTENTIOMETRIC SURFACE MAP
MFG AREA, SITE M11 LANDFILL
(OCTOBER 2018)

2018 ANNUAL GROUNDWATER MONITORING REPORT
JOLIET ARMY AMMUNITION PLANT
WILL COUNTY, ILLINOIS

PRINTED
3/1/2019

FIGURE 3-22
DRAWING NUMBER

IEA MWH
JOINT VENTURE

LEGEND:

- MW802 — COMBINED MONITORING WELL LOCATION AND NUMBER.
- MW334 (529.93) — DEEP BEDROCK MONITORING WELL LOCATION, NUMBER AND POTENTIOMETRIC SURFACE ELEVATION.
- 536 — POTENTIOMETRIC SURFACE CONTOUR (CONTOUR INTERVAL: 1 FT) (DASHED WHERE INFERRED)
- DIRECTION OF DEEP BEDROCK FLOW
- DIRECTION OF FLOW IN CREEK
- STUDY AREA BOUNDARY
- APPROXIMATE LIMITS OF LANDFILL

NOTES:

1. BASE MAP DEVELOPED FROM AN AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH, DATED 22 APRIL, 2017.
2. COORDINATES ARE UNIVERSAL TRANSVERSE MERCATOR (UTM), ZONE 16 NORTH, NORTH AMERICAN DATUM 1983 (NAD 83).
3. WATER LEVELS MEASURED BY IEA/MWH JV PERSONNEL ON 2 OCTOBER, 2018.
4. MONITORING WELLS USED TO CREATE THE WATER TABLE MAP ARE SHOWN WITH ELEVATIONS.
5. APPROXIMATE LIMITS OF LANDFILL OBTAINED FROM A DRAWING, "M11 NEW WELL LOCATIONS", PROJECT NO. 7-61M-11656, PREPARED BY AMEC EARTH & ENVIRONMENTAL, DATED JANUARY 2008.

north

Drawn By & Date: TMM 3/1/2019	Approved By & Date: RJR 3/1/2019	Revised By & Date:	Approved By & Date:

DEVELOPED BY: TMM
DRAWN BY: TMM
APPROVED BY: RJR
DATE: 3/1/2019

CONTRACT NO. W912QR-15-C-0016

VERIFY SCALE
0 1/2 1
BAR REPRESENTS ONE INCH ON ORIGINAL
SCALE 1" = 500'

REV	DATE	BY	DESCRIPTION

DEEP POTENTIOMETRIC SURFACE MAP MFG AREA, SITE M11 LANDFILL (OCTOBER 2018)

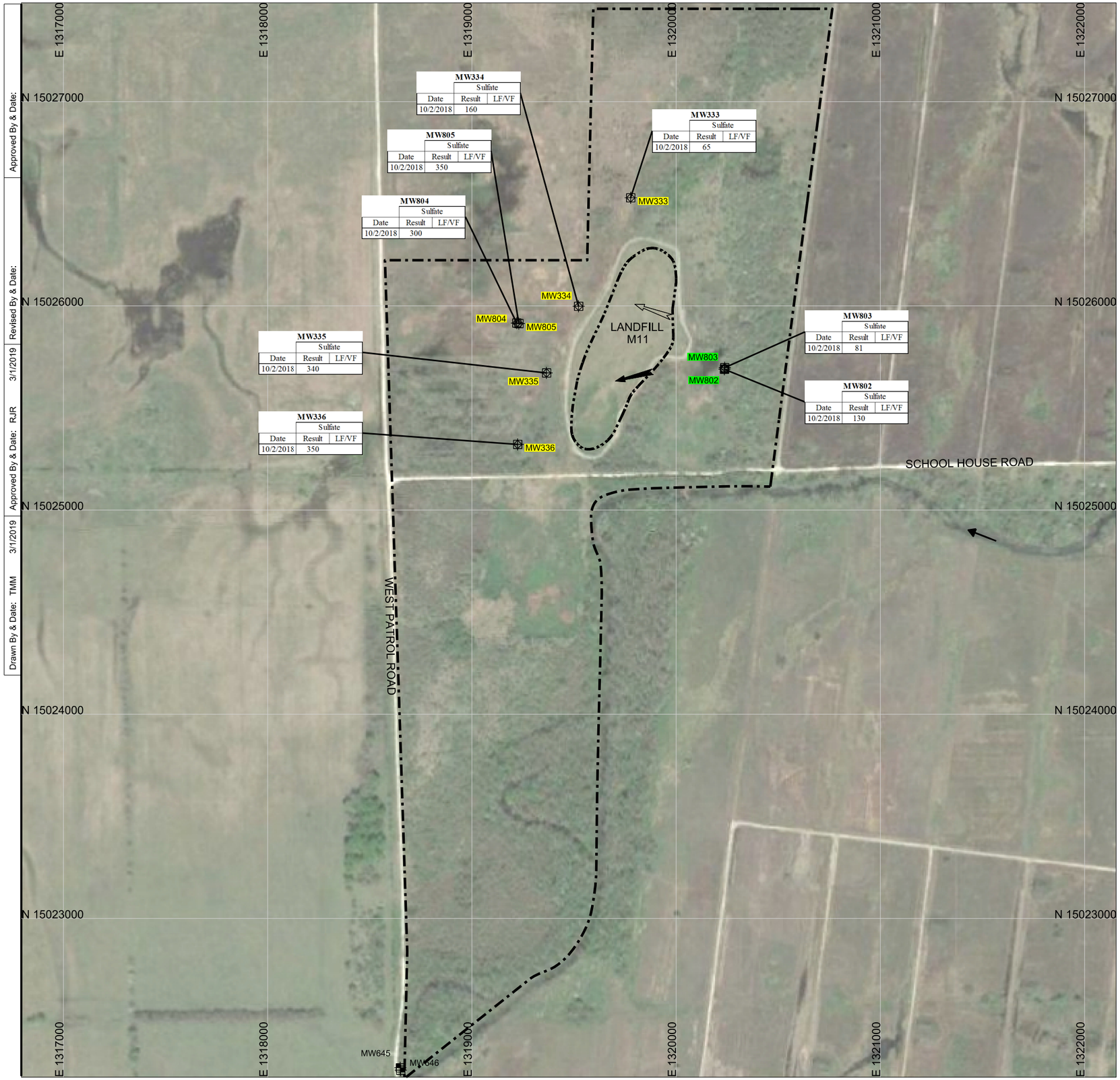
2018 ANNUAL GROUNDWATER MONITORING REPORT
JOLIET ARMY AMMUNITION PLANT
WILL COUNTY, ILLINOIS

PRINTED 3/1/2019

FIGURE 3-23

DRAWING NUMBER

IEA MWH
JOINT VENTURE



Drawn By & Date: TMM 3/1/2019
Approved By & Date: RJR 3/1/2019
Revised By & Date:
Approved By & Date:

LEGEND:

- MW802 COMBINED MONITORING WELL LOCATION, NUMBER, AND EXPLOSIVES DETECTIONS.
- MW335 SHALLOW BEDROCK MONITORING WELL LOCATION AND NUMBER.
- MW334 DEEP BEDROCK MONITORING WELL LOCATION AND NUMBER.
- DIRECTION OF SHALLOW BEDROCK FLOW
- DIRECTION OF DEEP BEDROCK FLOW
- DIRECTION OF FLOW IN CREEK
- GROUNDWATER MANAGEMENT ZONE BOUNDARY
- STUDY AREA BOUNDARIES
- APPROXIMATE LIMITS OF LANDFILL
- DOWNGRADIENT MONITORING POINT
- UPGRADIENT MONITORING POINT
- LF/VF LAB FLAG/VALIDATION FLAG
- mg/L MILLIGRAMS PER LITER
- RG REMEDIATION GOAL

ANALYTE (mg/L)	PROJECT ACTION LIMIT
SULFATE	400

NOTES:

1. PROJECT ACTION LIMITS ARE THE REMEDIAL GOALS AS SPECIFIED IN TABLE 6-2 OF THE 1998 RECORD OF DECISION. WHERE NO RG IS PRESENTED IN THE 1998 RECORD OF DECISION, THE PROJECT ACTION LIMIT IS OBTAINED FROM IEPA CLASS II GROUNDWATER STANDARDS.
2. BASE MAP DEVELOPED FROM AN AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH, DATED 22 APRIL, 2017.
3. COORDINATES ARE UNIVERSAL TRANSVERSE MERCATOR (UTM), ZONE 16 NORTH, NORTH AMERICAN DATUM 1983 (NAD 83).
4. SAMPLES COLLECTED BY IEA/MWH JV PERSONNEL ON 2 OCTOBER, 2018.
5. CONCENTRATIONS REPORTED IN MILLIGRAMS PER LITER (mg/L).
6. BOLDED VALUE INDICATES RG EXCEEDANCE.
7. APPROXIMATE LIMITS OF LANDFILL OBTAINED FROM A DRAWING, "M11 NEW WELL LOCATIONS", PROJECT NO. 7-61M-11656, PREPARED BY AMEC EARTH & ENVIRONMENTAL, DATED JANUARY 2008.

north

TMM DEVELOPED BY
TMM DRAWN BY
RJR APPROVED BY
3/1/2019 DATE
CONTRACT NO. W912QR-15-C-0016

VERIFY SCALE
0 1/2 1
BAR REPRESENTS ONE INCH ON ORIGINAL
SCALE 1" = 500'

REV	DATE	BY	DESCRIPTION

SULFATE DETECTIONS - MFG AREA
SITE M11 LANDFILL
(OCTOBER 2018)

2018 ANNUAL GROUNDWATER MONITORING REPORT
JOLIET ARMY AMMUNITION PLANT
WILL COUNTY, ILLINOIS

PRINTED
3/1/2019

FIGURE 3-24
DRAWING NUMBER

IEA MWH
JOINT VENTURE

APPENDIX A

POST-CLOSURE LANDFILL INSPECTION REPORTS

A1 - Post-closure Landfill Inspection Report - June 2018
A2 - Post-closure Landfill Inspection Report - October 2018

A1 - POST-CLOSURE LANDFILL INSPECTION REPORT - JUNE 2018

Former Joliet Army Ammunition Plant
Will County, Illinois

Appendix A1
Post-closure Landfill Inspection Report
June 2018

Long-Term Monitoring, Deed Restriction Implementation Plan, and CERCLA Five-Year Review

Prepared For:
U.S. Army Environmental Command under Contract with the U.S. Army Corps Of Engineers

Firm Fixed Price Contract
W912QR-15-C-0016

June 2018

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TABLE OF CONTENTS

Section **Page**

ACRONYMS AND ABBREVIATIONS ii

1.0 INTRODUCTION …….. 1

2.0 LANDFILL M13 DESCRIPTION 3

3.0 INSPECTION RESULTS 4

4.0 RECOMMENDATIONS 5

LIST OF ATTACHMENTS

Attachment

1 Post-closure Inspection Checklist

2 Inspection Photographs – Landfill M13

ACRONYMS AND ABBREVIATIONS

COC	contaminant of concern
GMZ	Groundwater Management Zone
IAC	Illinois Administrative Code
IEA/MWH JV	IEA, Inc./MWH Americas, Inc. Joint Venture
JOAAP	former Joliet Army Ammunition Plant
LTM Plan	Final Long-term Monitoring Plan for Environmental Remediation Services (MWH/TolTest, March 2010)
MFG	Manufacturing Area
RA	Remedial Action
Report	Post-closure Landfill Inspection Report, June 2018
USACE	United States Army Corps Of Engineers – Louisville District
USAEC	United States Army Environmental Command

1.0 INTRODUCTION

IEA, Inc./MWH Americas, Inc. (IEA/MWH JV) has been retained by the United States Army Corps Of Engineers – Louisville District (USACE) on behalf of the United States Army Environmental Command (USAEC) to conduct environmental services at the former Joliet Army Ammunition Plant (JOAAP), Will County, Illinois. Work will be executed under Firm Fixed Price Contract No. W912QR-15-C-0016, which includes quarterly inspection of the condition of Landfill M13 and annual inspection of Landfill M11, located at JOAAP. This Post-closure Landfill Inspection Report, June 2018 (Report) documents the conditions identified during the inspection of Landfill M13, conducted in June 2018.

Post-closure monitoring requirements for Landfills M13 and M11 are mandated by Illinois Administrative Code (IAC) Title 5, Subtitle G, Chapter 1, Subchapter c, Part 724, Subpart G, for 15 years at Landfill M13 and 30 years at Landfill M11.

According to the *Final Long-term Monitoring Plan for Environmental Remediation Services* (LTM Plan [MWH/TolTest, March 2010]):

- Section 4.2.2.3.2, *"According to IAC, the Landfill M11 cover will be inspected quarterly for the first five years and then annually for 25 years."*
- Section 4.2.3.2, *"Long-term monitoring of the landfill cap (M13) will include quarterly inspections of the cap, …"*

Landfill inspections have been generally conducted on a quarterly basis at Landfills M13 and M11 from October 2008 through December 2014 in accordance with the LTM Plan. Quarterly inspections at Landfill M11 ended in 2014, and will subsequently be conducted annually, generally during the fall annual groundwater sampling event.

Inspection objectives include:

- Confirm that the landfill cap has controlled leaching so that water quality will not be threatened in the future.
- Ensure that the cap is maintained in a manner that will not increase infiltration in the future or otherwise allow waste to be exposed.
- Keep survey points protected and visible to facilitate identification in the future.
- At M13, ensure the fence and signage installed to restrict site access remain in place and serviceable.
- At M13, certify that institutional controls remain in place.

According to IAC and the LTM Plan, Landfills M13 and M11 covers will be inspected for:

- Depressions indicating subsidence or other deformations that could breach the cover.
- Erosion features.

- Growth of deep-rooted vegetation or invasive species that would adversely affect evapotranspiration and/or erosion armoring.
- Debris or blockage of drainage structure.

Any damages or changes noted will be repaired to comply with the final design specifications for the cover.

In addition, land use restrictions have been imposed across the area within the fence. Annual certification is required to document that none of the following are occurring within the fence:

- Development
- Intrusive work
- Excavation that could mobilize contaminants of concern (COC)
- Alteration of surface water flow
- Vehicle use other than that associated with maintenance of the cover/cap.

2.0 LANDFILL M13 DESCRIPTION

Site M13 comprises approximately 106 acres of the central part of the Manufacturing Area (MFG) formerly known as the gravel pits. It lies north of the Tetryl Production Area, east of the TNT Ditch Complex, and west of the Acid Area. Disposal activities were confined to four discrete areas of the site, none of which extended beyond 12 acres in size. Historical records indicate landfilling took place in the Northern Gravel Pit during the period 1966 to 1984 and involved scrap metals, creosote-treated railroad ties, telephone poles, and construction/demolition debris. The three other pits received waste materials that do not appear to pose a threat to human health and the environment. The Remedial Action (RA) selected for the Site M13 was consolidation and capping into what is now called Landfill M13. Implementation of the remedy began in 2007 and was completed in 2008.

Landfill M13 comprises approximately 10.2 acres and is located in the northern part of Site M13 and within the MFG Groundwater Management Zone (GMZ). The current conceptual site model is that metals and benzo(a)pyrene in groundwater may be present as a result of leaching of waste materials in the Northern Gravel Pit. The explosives present in groundwater are far more likely to be present due to infiltration of wastewater in the TNT Ditch. There is no evidence to suggest explosive compounds were ever present in waste materials put into the pit. With the implementation of the RA at Site M13, it is anticipated that the landfill cap will prevent percolation of precipitation through waste consolidated in the landfill, and it is anticipated that contaminants in site groundwater will detach from the source areas and migrate as legacy plumes to the west. As such, concentrations are expected to decline with time.

Monitoring Locations

Groundwater sample points which are monitored at Landfill M13 during the semi-annual and annual sampling events include:

- Upgradient Locations
  - MW806
  - MW807
- Downgradient Locations
  - MW126R
  - MW362
  - MW808
  - MW809
  - MW811

3.0 INSPECTION RESULTS

The inspection at Landfill M13 was conducted on 18 June 2018. This Report includes copies of the inspection checklist, photographs, and recommendations. The Post-closure Inspection Checklist is included in Attachment 1, and Inspection Photographs – Landfill M13 are included in Attachment 2.

The cap for Landfill M13 was mowed in June 2018 (completed in June rather than April due to a lack of growth due to the late spring). The vegetative cover is well established. Additionally, fence-to-fence mowing was completed. The vegetation was cut to between approximately 4 to 6 inches in height. The rip rap along the perimeter of the landfill was mowed to the extent possible and sprayed with 2,4-D to prevent growth of woody plants in the rip rap that could compromise the integrity of the rip rap around the mounded landfill, without killing grasses. Woody vegetation outside of the landfill cap that continued to show signs of life was spot-treated using a stronger dyed herbicide.

The perimeter fence and site postings were in good condition.

During the inspection there was no indication of the following:

- Depressions indicating subsidence or other deformations that could breach the cover.
- Erosion features.

During the inspection there was no indication of the following activities:

- Development
- Intrusive work
- Excavation that could mobilize COCs
- Alteration of surface water flow (see above)
- Vehicle use other than that associated with maintenance of the cover/cap.

4.0 RECOMMENDATIONS

There were no deficiencies noted within this Report. A recommendation which needs to be addressed is the following:

Landfill M13:

- Fence-to-fence mowing will be completed during October 2018.

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Attachment 1
Post-closure Inspection Checklist

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JOAAP LANDFILL INSPECTION CHECKLIST			
Landfill Designation: M13		Date of Inspection: June 18, 2018	
Inspected By: Jeff Ramsby, IEA/MWH JV		Weather Conditions: Sunny, 92 deg.	
Names of those present at inspection: Matt Riley – COR, USACE Louisville District			
Checklist	Yes	No	Explanation
Site Security			
a. Was fencing, gates and signs in good condition?	√		
b. Were gates locked?	√		
c. Evidence of trespassing		√	
Landfill Cover			
d. Evidence of Settling and/or Ponding?		√	
e. Any desiccation or cracking detected?		√	
f. Erosion around cap?		√	
g. Animal burrowing detected?		√	
Vegetation Condition			
h. Is vegetation well established?	√		
i. Evidence of vegetation detrimental to cap?		√	
Landfill structures			
j. Evidence of damage to monitoring wells?		√	
k. Evidence of damage to gas vents?		√	
Field Conclusions			
l. Is there an imminent hazard to the integrity of the unit?		√	
m. Are repairs necessary?		√	
Certification			
Inspector Signature:		Printed Name: Jeff Ramsby	
Title: Sr. Hydrogeologist		Date: June 18, 2018	

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Attachment 2
Inspection Photographs – Landfill M13

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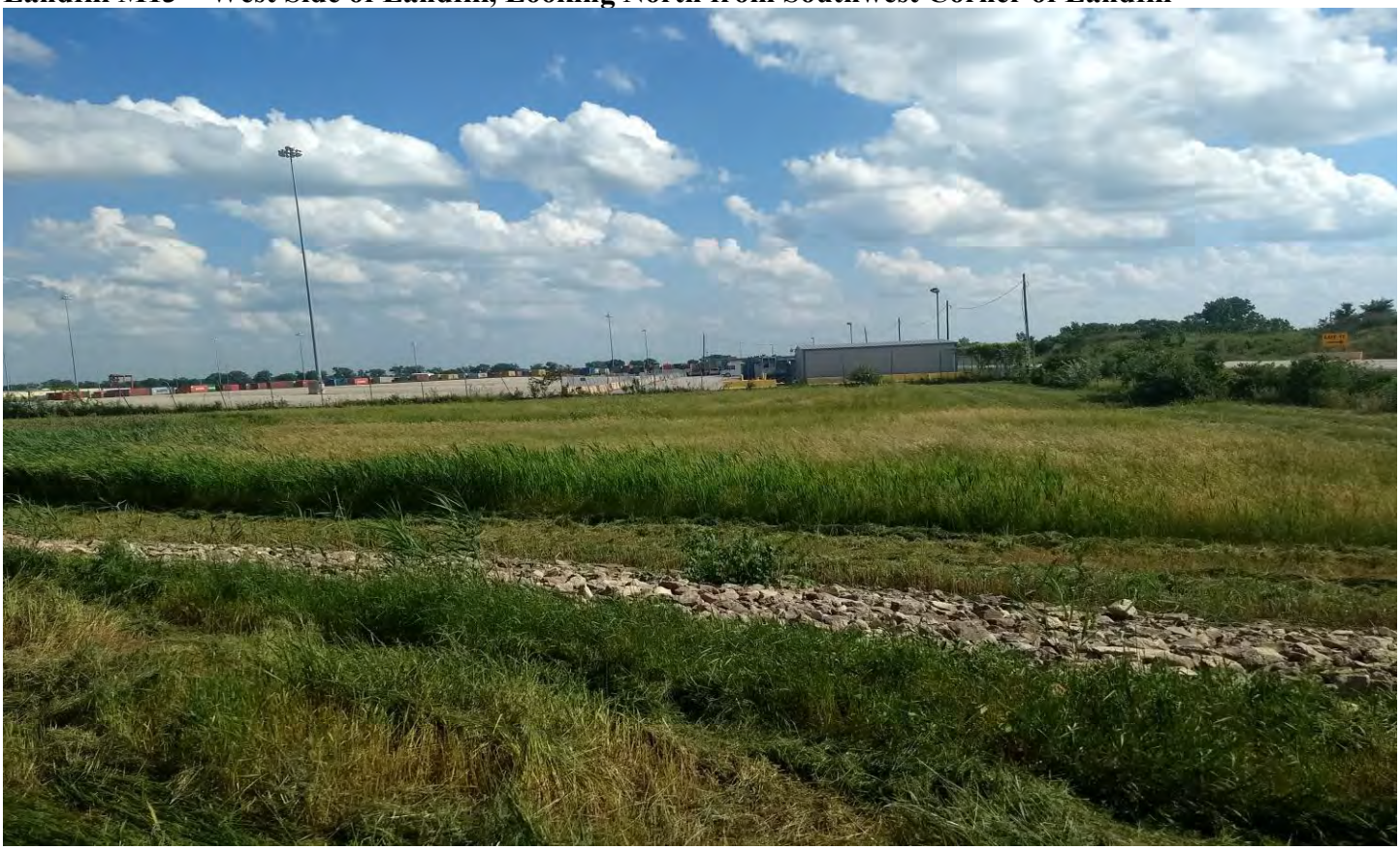
Landfill M13 – Top of Landfill, Looking Northeast from near Northwest Corner of Landfill

Landfill M13 – West Side of Landfill, Looking South from Near Northwest Corner of Landfill

Landfill M13 – West Side of Landfill, Looking North from Southwest Corner of Landfill



Landfill M13 – Southwest Perimeter Area of Landfill, Looking South from Southwest Corner of Landfill

Landfill M13 – Top of Landfill, Looking Northeast from Southwest Corner of Landfill

Landfill M13 – Top of Landfill, Dead Ground Squirrel at Den Identified Near Southwest Corner of Landfill

Landfill M13 – West Half of South Side of Landfill, Looking East from Southwest Corner of Landfill

Landfill M13 – West Half of South Side of Landfill, Looking West from Center of Landfill

Landfill M13 – East Half of South Side of Landfill, Looking East from Center of Landfill

Landfill M13 – East Half of South Side of Landfill, Looking West from Southeast Corner of Landfill

Landfill M13 – East Side of Landfill, Looking North from Southeast Corner of Landfill

Landfill M13 – East Side Landfill, Looking South from Northeast Corner of Landfill

Landfill M13 – Top of Landfill, Looking Southwest from Northeast Corner of Landfill

Landfill M13 – North Side of Landfill, Looking West from Northeast Corner of Landfill

Landfill M13 – Top of Landfill, Looking Southeast from Center of Landfill

Landfill M13 – Top of Landfill, Looking Northwest from Center of Landfill

A2 - POST-CLOSURE LANDFILL INSPECTION REPORT - OCTOBER 2018

Former Joliet Army Ammunition Plant
Will County, Illinois

Appendix A2
Post-closure Landfill Inspection Report
October 2018

Long-Term Monitoring, Deed Restriction Implementation Plan, and CERCLA Five-Year Review

Prepared For:
U.S. Army Environmental Command under Contract with the U.S. Army Corps Of Engineers

Firm Fixed Price Contract
W912QR-15-C-0016

October 2018

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TABLE OF CONTENTS

Section **Page**

ACRONYMS AND ABBREVIATIONS ii

1.0 INTRODUCTION …….. 1

2.0 LANDFILL DESCRIPTIONS 3

3.0 INSPECTION RESULTS 5

4.0 RECOMMENDATIONS 7

LIST OF ATTACHMENTS

Attachment

1 Post-closure Inspection Checklists

2 Inspection Photographs

RJR/rjr/SJA
V:\1734\active\residency_review\173440065\joliet_2018\Annual Report\Final\Appendix A - Landfill Inspection Reports\Appendix A2 - October Inspection Report\TOC.docx

ACRONYMS AND ABBREVIATIONS

COC	contaminants of concern
GMZ	Groundwater Management Zone
IAC	Illinois Administrative Code
IEA/MWH JV	IEA, Inc./MWH Americas, Inc. Joint Venture
JOAAP	former Joliet Army Ammunition Plant
LTM Plan	Final Long-term Monitoring Plan for Environmental Remediation Services (MWH/TolTest, March 2010)
MFG	Manufacturing Area
RA	Remedial Action
Report	Post-closure Landfill Inspection Report, October 2018
USACE	United States Army Corps Of Engineers – Louisville District
USAEC	United States Army Environmental Command

1.0 INTRODUCTION

IEA, Inc./MWH Americas, Inc. Joint Venture (IEA/MWH JV) has been retained by the United States Army Corps Of Engineers – Louisville District (USACE) on behalf of the United States Army Environmental Command (USAEC) to conduct environmental services at the former Joliet Army Ammunition Plant (JOAAP), Will County, Illinois. Work will be executed under Firm Fixed Price Contract No. W912QR-15-C-0016 which includes quarterly inspection of the condition of Landfill M13 and annual inspection of Landfill M11, located at JOAAP. This Post-closure Landfill Inspection Report, October 2018 (Report) documents the conditions identified during the inspection of the landfills conducted in October 2018.

Post-closure monitoring requirements for Landfills M11 and M13 are mandated by Illinois Administrative Code (IAC) Title 5, Subtitle G, Chapter 1, Subchapter c, Part 724, Subpart G for 15 years at Landfill M13 and 30 years at Landfill M11.

According to the *Final Long-term Monitoring Plan for Environmental Remediation Services* (LTM Plan [MWH/TolTest, March 2010]):

- Section 4.2.2.3.2, *"According to IAC, the Landfill M11 cover will be inspected quarterly for the first five years and then annually for 25 years."*
- Section 4.2.3.2, *"Long-term monitoring of the landfill cap (M13) will include quarterly inspections of the cap, …"*

Landfill inspections have been generally conducted on a quarterly basis at Landfills M11 and M13 from October 2008 through December 2014 in accordance with the LTM Plan. Quarterly inspections at Landfill M11 ended in 2014 and will subsequently be conducted annually, generally during the fall annual groundwater sampling event.

Inspection objectives include:

- Confirm that the landfill cap has controlled leaching so that water quality will not be threatened in the future.
- Ensure that the cap is maintained in a manner that will not increase infiltration in the future or otherwise allow waste to be exposed.
- Keep survey points protected and visible to facilitate identification in the future.
- At M13 ensure the fence and signage installed to restrict site access remain in place and serviceable.
- At M13 certify that institutional controls remain in place.

According to IAC and the LTM Plan, Landfills M11 and M13 covers will be inspected for:

- Depressions indicating subsidence or other deformations that could breach the cover.
- Erosion features.
- Growth of deep rooted vegetation or invasive species that would adversely affect evapotranspiration and/or erosion armoring.

- Debris or blockage of drainage structure.

Any damages or changes noted will be repaired to comply with the final design specifications for the cover.

In addition, land use restrictions have been imposed across the area within the fence. Annual certification is required to document that none of the following are occurring within the fence:

- Development
- Intrusive work
- Excavation that could mobilize contaminants of concern (COC)
- Alteration of surface water flow
- Vehicle use other than that associated with maintenance of the cover/cap.

2.0 LANDFILL DESCRIPTIONS

2.1 LANDFILL M11

Site M11 comprises approximately 133 acres and is located in the southwestern portion of the Manufacturing Area (MFG) located on the west side of Highway 53. Site M11 was divided into two sections by School House Road, and is bordered on the west by West Patrol Road. M11 north encompassed approximately 10.5 acres of former gravel pits that were mined and filled with waste. M11 south, a former gravel pit, encompassed approximately 5.6 acres that was also mined and filled with waste. The remedial action (RA) selected for Site M11 was waste consolidation and capping into what is now called Landfill M11. Implementation of the RA began in 2006 and was completed in 2008.

Landfill M11 occupies approximately 10.5 acres of the Site M11 north area. There is no groundwater management zone (GMZ) associated with Landfill M11. The current conceptual site model is that Landfill M11 is believed to contain manganese- and sulfate-containing waste that could potentially contaminate underlying groundwater. With the implementation of the RA at Site M11, it is anticipated that the landfill cap will prevent percolation of precipitation through waste consolidated in the landfill, thus preventing groundwater contamination.

2.1.1 Monitoring Locations

Groundwater is monitored at Landfill M11 during the annual event only. Groundwater sample points were monitored at Landfill M11 during the annual sampling event conducted in October 2018 as follows:

- Upgradient Locations
  - MW802
  - MW803.
- Downgradient Locations
  - MW333
  - MW334
  - MW335
  - MW336
  - MW804
  - MW805.

2.2 LANDFILL M13

Site M13 comprises approximately 106 acres of the central part of the Manufacturing Area (MFG) formerly known as the gravel pits. It lies north of the Tetryl Production Area, east of the TNT Ditch Complex, and west of the Acid Area. Disposal activities were confined to four discrete areas of the site, none of which extended beyond 12 acres in size. Historical records indicate landfilling

took place in the Northern Gravel Pit during the period 1966 to 1984 and involved scrap metals, creosote-treated railroad ties, telephone poles, and construction/demolition debris. The three other pits received waste materials that do not appear to pose a threat to human health and the environment. The Remedial Action (RA) selected for the Site M13 was consolidation and capping into what is now called Landfill M13. Implementation of the remedy began in 2007 and was completed in 2008.

Landfill M13 comprises approximately 10.2 acres and is located in the northern part of Site M13 and within the MFG Groundwater Management Zone (GMZ). The current conceptual site model is that metals and benzo(a)pyrene in groundwater may be present as a result of leaching of waste materials in the Northern Gravel Pit. The explosives present in groundwater are far more likely to be present due to infiltration of wastewater in the TNT Ditch. There is no evidence to suggest explosive compounds were ever present in waste materials put into the pit. With the implementation of the RA at Site M13, it is anticipated that the landfill cap will prevent percolation of precipitation through waste consolidated in the landfill and it is anticipated that contaminants in site groundwater will detach from the source areas and migrate as legacy plumes to the west. As such, concentrations are expected to decline with time.

2.2.1 Monitoring Locations

Groundwater sample points were monitored at Landfill M13 during the annual sampling event conducted in October 2018 as follows:

- Upgradient Locations
  - MW806
  - MW807
- Downgradient Locations
  - MW126R
  - MW362
  - MW808
  - MW809
  - MW811

3.0 INSPECTION RESULTS

Landfill inspections were conducted on 9 October 2018 at Landfills M11 and M13. This Report includes copies of the inspection checklists, photographs, and recommendations. The Post-closure Inspection Checklists are included in Attachment 1 and Inspection Photographs are included in Attachment 2.

3.1 LANDFILL M11

Landfill M11 is scheduled to only be inspected annually. The cap for Landfill M11 was mowed in October 2018. The vegetative cover was well established. Additionally, fence-to-fence mowing was completed. The vegetation was cut to between 4 and 6 inches in height.

No evidence of damage due to burrowing animals was observed.

The perimeter fence and site postings were in good condition.

During the inspection there was no indication of erosional erosion features.

During the inspection there was no indication of the following activities:

- Development
- Intrusive work
- Excavation that could mobilize COCs
- Alteration of surface water flow (see above)
- Vehicle use other than that associated with maintenance of the cover/cap.

During the inspection there was no indication of the following activities:

- Development
- Intrusive work
- Excavation that could mobilize COCs
- Alteration of surface water flow (see above)
- Vehicle use other than that associated with maintenance of the cover/cap

3.2 LANDFILL M13

The cap for Landfill M13 was mowed in October 2018. The vegetative cover was well established. Additionally, fence-to-fence mowing was completed. The vegetation was cut to between 4 and 6 inches in height.

No evidence of damage due to burrowing animals was observed.

The perimeter fence and site postings were in good condition.

During the inspection there was no indication of the following features:

- Depressions indicating subsidence or other deformations that could breach the cover.
- Erosion features.

During the inspection there was no indication of the following activities:

- Development
- Intrusive work
- Excavation that could mobilize COCs
- Alteration of surface water flow
- Vehicle use other than that associated with maintenance of the cover/cap.

4.0 RECOMMENDATIONS

There were no deficiencies noted within this Report. Recommendations which need to be addressed inlude the following:

Landfill M11:

- Fence-to-fence mowing and rip rap spraying to prevent growth of woody plants in the rip rap that could compromise the integrity of the rip rap around the mounded landfill, without killing grasses, will be completed during the semi-annual sampling event scheduled for April 2019.

Landfill M13:

- Fence-to-fence mowing and rip rap spraying to prevent growth of woody plants in the rip rap that could compromise the integrity of the rip rap around the mounded landfill, without killing grasses, will be completed during the semi-annual sampling event scheduled for April 2019.

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Attachment 1
Post-Closure Inspection Checklists

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JOAAP LANDFILL INSPECTION CHECKLIST			
Landfill Designation: M11		Date of Inspection: October 10, 2018	
Inspected By: Jeff Ramsby, IEA/MWH JV		Weather Conditions: Conditions: Sunny, 75 deg.	
Names of those present at inspection: Matt Riley – USACE COR			
Checklist	Yes	No	Explanation
Site Security			
a. Was fencing, gate, and signs in good condition?	√		There was one fencepost that was likely hit by the mower, is bent, and needs replacement.
b. Was gate locked?	√		
c. Evidence of trespassing		√	
Landfill Cover			
d. Evidence of Settling and/or Ponding?		√	There were several slight depressions noted on the west side slope of the landfill. However, there was no associated erosion.
e. Any desiccation or cracking detected?		√	
f. Erosion around cap?		√	
g. Animal burrowing detected?		√	
Vegetation Condition			
h. Is vegetation well established?	√		
i. Evidence of vegetation detrimental to cap?		√	
Landfill structures			
j. Evidence of damage to monitoring wells?		√	
k. Evidence of damage to gas vents?		√	
Field Conclusions			
l. Is there an imminent hazard to the integrity of the unit?		√	
m. Are repairs necessary?		√	
Certification			
Inspector Signature:		Printed Name: Jeff Ramsby	
Title: Senior Hydrogeologist		Date: October 10, 2018	

JOAAP LANDFILL INSPECTION CHECKLIST			
Landfill Designation: M13		Date of Inspection: October 9, 2018	
Inspected By: Jeff Ramsby, IEA/MWH JV		Weather Conditions: Sunny, 82 deg.	
Names of those present at inspection: Matt Riley – USACE COR			
Checklist	Yes	No	Explanation
Site Security			
m. Was fencing, gate, and signs in good condition?	√		
n. Was gate locked?	√		
o. Evidence of trespassing		√	
Landfill Cover			
p. Evidence of Settling and/or Ponding?		√	
q. Any desiccation or cracking detected?		√	
r. Erosion around cap?		√	
s. Animal burrowing detected?		√	
Vegetation Condition			
t. Is vegetation well established?	√		
u. Evidence of vegetation detrimental to cap?		√	
Landfill structures			
v. Evidence of damage to monitoring wells?		√	
w. Evidence of damage to gas vents?		√	
Field Conclusions			
x. Is there an imminent hazard to the integrity of the unit?		√	
m. Are repairs necessary?		√	
Certification			
Inspector Signature:		Printed Name: Jeff Ramsby	
Title: Senior Hydrogeologist		Date: October 9, 2018	

Attachment 2
Inspection Photographs

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Landfill M13 – West Side of Landfill, Looking North from Southwest Corner of Landfill

Landfill M13 – Top of Landfill, Looking Northeast from Southwest Corner of Landfill

Landfill M13 – South Side of Landfill, Looking East from Southwest Corner of Landfill

Landfill M13 – South Side of Landfill, Looking West from Southwest Corner of Landfill

Landfill M13 – Top of Landfill, Looking Northwest from Southeast Corner of Landfill

Landfill M13 – East Side of Landfill, Looking North from Southeast Corner of Landfill

Landfill M13 – Top of Landfill, Looking West from Near Center of East Side of Landfill

Landfill M13 – East Side of Landfill, Looking South from Northeast Corner of Landfill

Landfill M13 – North Side of Landfill, Looking East from Near Center of Landfill

Landfill M13 – North Side of Landfill, Looking West from Near Center of Landfill

Landfill M13 – Top of Landfill, Looking Southwest from Northeast Corner of Landfill

Landfill M11 – West Side, Looking North from Near North End of Landfill

Landfill M11 – Top of Landfill, Looking North from Near North End of Landfill

Landfill M11 – South End of Landfill, Looking North from off North End of Landfill

Landfill M11 – East Side of Landfill, Looking Southeast from Near North End of Landfill

Landfill M11 – North End of Landfill on East Side, Looking East from Near North End of Landfill

Landfill M11 – Top of Landfill, Looking South from Near North End of Landfill

Landfill M11 – West Side of Landfill, Looking South from Near North End of Landfill

Landfill M11 – Mowed Perimeter Area on West Side, Looking South from North Center of Landfill

APPENDIX B

HISTORICAL DATA TABLES

B1 - Summary of Historical Groundwater Results – Explosives
B2 - Summary of Historical Groundwater Results – Metals
B3 - Summary of Historical Groundwater Results – Indicator Parameters
B4 - Summary of Historical Groundwater Results – Volatile Organic Compounds
B5 - Summary of Historical Groundwater Results – Semivolatile Organic Compounds

B1 - SUMMARY OF HISTORICAL GROUNDWATER RESULTS – EXPLOSIVES

TABLE B1

Summary of Analytical Results - Explosives
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	**1,3-DNB**		**2,4-DNT**		**2,6-DNT**		**2-A-4,6-DNT**		**4-A-2,6-DNT**		**HMX**		**NB**		**2-NT**		**3-NT**		**4-NT**		**RDX**		**Tetryl**		**1,3,5-TNB**		**2,4,6-TNT**	
		Units	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
		Project Action Limit[1]	10		0.42		0.42		NS		NS		5100		51		5100		NS		NS		2.6		200		5.1		9.5	
		Surface Water RG[2]	4		330		150		NS		NS		260		8000		62		NS		NS		500		NS		15		75	
Site	**Well**	**Date**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**
		In-Plume																												
	MW131	10/25/2005	<3.9		<3.9		**9.6**		48		33		<7.8		<3.9		<7.8		<7.8		<7.8		<3.9		<7.8		**1,800**		**1,300**	
		5/5/2006	<3.9		<3.9		<7.8		75		62		<7.8		<3.9		<7.8		<7.8		<7.8		<3.9		<7.8		**3,200**		**4,400**	
		10/19/2006	<3.9		<3.9		<7.8		29		26		<7.8		<3.9		<7.8		<7.8		<7.8		<3.9		<7.8		**180**		**150**	
		5/1/2007	<44		<44		<88		<88		<88		<88		<44		<88		<88		<88		<44		<88		**4,200**		**9,900**	
		5/1/2007 (DUP)	<50		<50		<100		<100		<100		<100		<50		<100		<100		<100		<50		<100		**4,500**		**10,000**	
		10/16/2007	<39		<39		<78		<78		<78		<78		<39		<78		<78		<78		<39		<78		**1,700**		**1,100**	
		5/14/2008	<4.5		<4.5		<9		100		63		<9		<4.5		<9		<9		<9		<4.5		<9		**3,100**		**4,900**	
		10/28/2008	<3.9		<3.9		<7.8		27		30		<7.8		<3.9		<7.8		<7.8		<7.8		<3.9		<7.8		**1,100**		**870**	
		5/1/2009	<1.6		<3.1		<3.1		21		36		<3.1		<1.6		<3.1		<3.1		<3.1		<1.6		<3.9		**460**		**1,400**	
		10/27/2009	<4.1		<7.9		<7.9		89		110		<7.9		17		<7.9		<7.9		<7.9		<4.1		<9.9		**4,000**		**11,000**	
		4/12/2010	<4.0		<7.8		<7.8		55		66		<7.8		<4.0		<7.8		<7.8		<7.8		<4.0		<9.8		**3,200**		**4,100**	
		10/27/2010	0.49	/ J	<0.54		**6.8**	/ J	40		37		<0.54		<0.28		1.3	/ J	<0.54		<0.54		<0.28		<0.68		**1,700**		**1,000**	
		4/15/2011	<30		<57		<57		54	F /	91		<57		<30		<57		<57		<57		<30		<72		**3,400**		**5,800**	
		10/11/2011	<1.9		<1.9		<1.9		40		57	/ J	6		<1.9		<3.7		<3.7		<3.7		1.3	F /	<4.6		<1.9		**1,100**	
		4/12/2012	5.4	/ J	<3.1		<3.1		65		70		<3.1		<1.6		<3.1		<3.1		<3.1		<1.6		<3.9		<1.6		**2,200**	
		10/29/2012	<16		<31		<31		<31		35		<31		<16		<31		<31		<31		<16		<39		<16		**1,000**	
		4/13/2013	<0.37	U / UJ	<0.37	U / UJ	<0.18	U / UJ	40	/ J	55	/ J	<0.37	U / UJ	<0.37	U / UJ	<0.37	U / UJ	<0.37	U / UJ	<0.92	U / UJ	<0.18	U / UJ	<0.22	U / UJ	**3,100**	/ J	**4,200**	/ J
		10/19/2013	<0.43	U / UJ	<0.32	U / UJ	<0.21	U / UJ	24	/ J	<43		<86		6.2	/ J	<0.43	U / UJ	<0.43	U / UJ	<1.1	U / UJ	<43		<0.26	U / UJ	**1,400**		**860**	
		10/28/2014	<0.38		<0.38		<0.19		58	/ J	<0.19		<0.38		<0.38		160	/ J	<0.38		<0.95		<0.19		2.2	/ J	**910**	/ J	**1,100**	/ J
		12/9/2014	<83		<0.42	U / UJ	<42		11	/ J	<0.21	U / UJ	<83		<83		<83		<83		<210		<42		<50		**2,000**		**1,500**	
		8/26/2015	<20		<6.0		**2.2**	J	52		56		<20		<20		<20		<20		<20		<20		<20		**1,200**		**4,600**	
		10/19/2015	<1		<0.3		**3.5**		31		47		<1		1.3		<1		<1		<1		<1		<1		**1,800**		**1,900**	
		4/18/2016	< 10		< 3.0		< 3.0		45		48		< 10		< 10		< 10		< 10		< 10		< 10		< 10		**1200**		**3800**	
		10/10/2016	<10		<3.0	/ UJ	**2.3**	J / J	<10	/ UJ	69		<10		<10		<10	/ UJ	<10	/ UJ	<10		<10		<10		**1,400**		**5,500**	
		4/22/2017	<22	/ UJ	<6.6	/ UJ	**10**	/ J	39	/ J	43	/ J	<22	/ UJ	<22	/ UJ	<22	/ UJ	<22	/ UJ	<22	/ UJ	<22	/ UJ	<22	/ UJ	**2,200**	/ J	**4,500**	/ J
		10/3/2017	<10		<3		<3		30		31		11	/ J	<10		<10		<10		<10		<10		<10		**1,800**		**1,200**	
		4/10/2018	<20		<6		<6		43		52		<20	/ UJ	<20		<20		<20		<20		<20		<20		**2,900**		**4,000**	
		10/1/2018	<5		<1.5		**1.3**	J /	23		23		<5		<5		<5		<5		<5		<5		<5		**1,400**		**920**	
L1	MW173	10/25/2005	<0.4		**0.43**		<0.79		6.4		6.9		1.8		<0.4		<0.79		<0.79		<0.79		**13**		<0.79		2.2		**18**	
		5/5/2006	<0.46		<0.46		<0.91		4.6		5		1.4		<0.46		<0.91		2.8		<0.91		**11**		<0.91		2.5		**15**	
		10/19/2006	<0.57		<0.57		<1.1		5.5		6.4		<1.1		<0.57		<1.1		<1.1		<1.1		**11**		<1.1		<0.57		**9.6**	
		5/1/2007	<0.39		<0.39		<0.78		5.6		5.9		2.3		<0.39		<0.78		<0.78		<0.78		**15**		<0.78		3		**33**	
		10/16/2007	<0.39		<0.39		<0.78		5		7.2		1.6		<0.39		<0.78		<0.78		<0.78		**11**		<0.78		<0.39		7.2	
		5/14/2008	<0.39		<0.39		<0.78		4.3		4.7		1.1		<0.39		<0.78		<0.78		<0.78		**9.3**		<0.78		1.4		**14**	
		10/27/2008	<0.39		<0.39		<0.78		5		5.5		1.1		<0.39		<0.78		<0.78		<0.78		**9.5**		<0.78		1.5		**15**	
		5/1/2009	<0.17		<0.32		<0.32		4.4		5.1		1.3		<0.17		<0.32		<0.32		<0.32		**12**		<0.4		2.6		**20**	
		10/27/2009	<0.22		<0.43		<0.43		1.8		3.7		1.6	/ J	<0.22		<0.43		<0.43		0.19	F /	**9.6**		<0.54		<0.22		1.7	
		4/13/2010	<0.17		<0.32		<0.32		4.1		4.8		1.2		<0.17		<0.32		<0.32		<0.32		**8.6**		<0.40		0.94		**10**	
		10/27/2010	<0.20		<0.38		<0.38		0.84		1		<0.38		<0.20		<0.38		<0.38		<0.38		**3.4**		<0.48		<0.20		0.95	
		4/14/2011	<0.31		<0.6		<0.6		4.7		5.9		1.3		<0.31		<0.6		<0.6		<0.6		**9.6**		<0.76		0.63		**10**	
		10/11/2011	<0.33		<0.33		<0.33		3.4	/ J	2.2	/ J	1.4		<0.33		<0.65		<0.65		<0.65		**10**		<0.81		<0.33		8.2	/ J
		4/11/2012	<0.16		<0.31		<0.31		4.8		5.4		1.4	/ J	<0.16		<0.31		<0.31		<0.31		**10**		<0.39		<0.16		**12**	
		10/29/2012	<0.8		<1.6		<1.6		<1.6	U / J	<1.6	U / J	<1.6		<0.8	U / J	<1.6		<1.6	U / J	<1.6	U / J	<0.8	U / J	<2	U / J	<0.8		<0.8	U / J
		10/29/2012 (DUP)	<0.8		<1.6		<1.6		4.3		4.3		<1.6		<0.8		<1.6		<1.6		<1.6		**6.2**	/ J	<2		<0.8		2.8	
		4/13/2013	<0.37		<0.37		<0.18		1.3		1	/ J	0.22	F / J	<0.37		<0.37		<0.37		<0.92		1.6	/ J	<0.22		<0.92		0.56	
		10/19/2013	<0.43		<0.32		<0.22		4.5		5.3		0.79		<0.43		<0.43		<0.43		<1.1		**7.2**		<0.26		0.9	F /	**9.7**	
		10/27/2014	<0.39		<0.39		<0.19		4.3		5.9		1.5	/ J	<0.39		<0.39		<0.39		<0.96		**9**		<0.23	U / UJ	<0.96		6.2	
		12/9/2014	<0.41		<0.41		<0.2		2.2	/ J	2.7		0.67		<0.41		<0.41		<0.41		<1		**4.4**		<0.25		<1		4.3	
		8/20/2015	<1.0		<0.30		<0.30		3.3		4.9		0.43	/ J	<1.0		<1.0		<1.0		<1.0		**3.7**		<1.0		<1.0		2.3	
		10/20/2015	<1		<0.3		<0.3		2.5		3.3		0.47	J /	<1		<1		<1		<1		**5.5**		<1		0.3	J /	4.4	
		4/18/2016	< 1.0		< 0.30		< 0.30		3.2		3.8		0.63	J/J	< 1.0		< 1.0		< 1.0		< 1.0		**6.6**		< 1.0		0.48	J/	8.5	
		10/10/2016	<1.0		<0.30		<0.30		3.9		5		0.74	J / J	<1.0		<1.0	/ UJ	<1.0	/ UJ	<1.0		**7.6**		<1.0		0.63	J /	9.4	
		4/22/2017	<1.0	/ UJ	<0.30	/ UJ	<0.30	/ UJ	3.6	/ J	4.4	/ J	0.94	J / J	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	**8.1**	/ J	<1.0	/ UJ	0.68	J / J	**13**	/ J
		10/3/2017	<1		<0.3		<0.3		3.4		4.4		0.86	J /	<1		<1		<1		<1		**5.7**		<1		<1		5.8	
		4/10/2018	<1		<0.3		<0.3		3.1		3.9		0.64	J / J	<1		<1		<1		<1		**6.3**		<1		0.38	J /	8.2	
		10/1/2018	<1		<0.3		<0.3		2.9		3.7		0.68	J / J	<1		<1		<1		<1		**4.9**		<1		<1		5	
	WES1	10/25/2005	<0.39		<0.39		<0.78		2.7		2.9		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		2		2.6	
		5/5/2006	<0.39		<0.39		<0.78		8		8.3		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		**14**		**14**	
		10/19/2006	<0.39		<0.39		<0.78		4		4.8		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		4.5		3.7	
		5/1/2007	<3.9		<3.9		<7.8		16		22		<7.8		<3.9		<7.8		<7.8		<7.8		<3.9		<7.8		**71**		**67**	
		10/16/2007	<5.9		<5.9		<12		16		20		<12		<5.9		<12		<12		<12		<5.9		<12		**20**		**35**	
		5/14/2008	<3.9		<3.9		<7.8		12		17		<7.8		<3.9		<7.8		<7.8		<7.8		<3.9		<7.8		**34**		**40**	
		10/28/2008	<0.39		<0.39		<0.78		11		15		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		**8.2**		**17**	
		10/28/2008 (DUP)	<0.53		<0.53		<1.1		11		15		<1.1		<0.53		<1.1		<1.1		<1.1		<0.53		<1.1		**8.5**		**19**	
		10/27/2009	<0.22		<0.43		<0.43		2.1		3.4		<0.43		<0.22		<0.43		<0.43		<0.43		0.36		<0.54		0.78		1.7	
		4/12/2010	<0.17		<0.32		<0.32		4.2		6.4		<0.32		<0.17		<0.32		<0.32		<0.32		<0.17		<0.40		3.7		7.4	
		10/27/2010	0.096	F /	**1.6**		<0.31		15		18		<0.31		<0.16		<0.31		<0.31		<0.31		0.73		<0.39		**21**		**34**	
		10/27/2010 (DUP)	<0.21		**1.8**		<0.41		17		20		<0.41		<0.21		<0.41		<0.41		<0.41		<0.21		<0.51		**23**		**38**	
		4/15/2011	<0.29		<0.56		<0.56		14		26		<0.56		<0.29		<0.56		<0.56		<0.56		<0.29		<0.71		**39**		**48**	
		10/11/2011	<0.25		<0.25		<0.25		11		15		<0.49		<0.25		<0.49		<0.49		<0.49		0.26		<0.61		<0.25		**31**	/ J
		4/12/2012	<1.6		<3.1		<3.1		13		21	/ J	<3.1		3.9		<3.1		<3.1		<3.1		<1.6		<3.9		**40**	/ J	**38**	
		10/29/2012	<0.8		<1.6		<1.6		8.1	/ J	9.1		<1.6		<0.8		<1.6		<1.6		<1.6		<0.8		<2		<0.8		6.4	
		4/13/2013	<0.4	U / UJ	<0.4	U / UJ	0.29	/ JJ	10	/ J	12	/ J	<0.4	U / UJ	0.11	F / JJ	<0.4	U / UJ	<0.4	U / UJ	<1	U / UJ	<0.2	U / UJ	<0.24	U / UJ	**16**	F / J	**25**	/ J
		10/19/2013	<0.43	U / UJ	**1.3**	/ J	<0.21		15	/ J	16	/ J	<0.43	U / UJ	<0.43	U / UJ	<0.43		<0.43	U / UJ	<1.1		<0.21		<0.26		<1.1	U / UJ	**16**	/ J
		10/28/2014	<0.37		<0.37		<0.19		5.9	/ J	6.9	/ J	<0.37		<0.37		0.23	F / J	<0.37		<0.93		<0.19		<0.22	U / UJ	**16**	/ J	**14**	/ J
		12/9/2014	<0.39		<0.39		<0.2		2.3	/ J	2.7		<0.39		<0.39		<0.39		<0.39		<0.98		<0.2		<0.24		0.27	F / J	1.1	
		8/26/2015	<1.0		<0.30		<0.30		5.9		8.3		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		**23**		**19**	
		10/19/2015	<1		<0.3		<0.3		2.9		3.3		<1		<1		<1		<1		<1		<1		<1		**5.8**		5.3	
		4/18/2016	< 1.0	/UJ	< 0.30	/UJ	< 0.30	/UJ	5.9	/J	8.3	/J	< 1.0		< 1.0	/UJ	< 1.0	/UJ	< 1.0	/UJ	< 1.0		< 1.0		< 1.0		**33**		**27**	
		10/10/2016	<1.0		<0.30	/ UJ	<0.30		6.6	/ J	13		<1.0		<1.0		<1.0	/ UJ	<1.0	/ UJ	<1.0		<1.0		<1.0		**49**		**36**	/ J
		4/22/2017	<1.0	/ UJ	<0.31	/ UJ	<0.31	/ UJ	8.5	/ J	12	/ J	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	**100**	/ J	**74**	/ J
		10/3/2017	<1	/ UJ	<0.3	/ UJ	<0.3	/ UJ	16	/ J	18	/ J	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	**44**	/ J	**64**	/ J
		4/10/2018	<1		<0.3		<0.3		8.6		12		<1	/ UJ	<1		<1		<1		<1		<1		<1		**54**		**46**	/ J
		10/1/2018	<1		0.25	J / J	0.33	/ J	14		17		<1		<1		<1		<1		<1		<1		<1		**26**		**41**	

TABLE B1

Summary of Analytical Results - Explosives
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	1,3-DNB		2,4-DNT		2,6-DNT		2-A-4,6-DNT		4-A-2,6-DNT		HMX		NB		2-NT		3-NT		4-NT		RDX		Tetryl		1,3,5-TNB		2,4,6-TNT	
		Units	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
		Project Action Limit[1]	10		0.42		0.42		NS		NS		5100		51		5100		NS		NS		2.6		200		5.1		9.5	
		Surface Water RG[2]	4		330		150		NS		NS		260		8000		62		NS		NS		500		NS		15		75	
Site	Well	Date	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF
		Early Warning																												
L1	MW174	10/25/2005	<0.77		<0.77		<1.5		<1.5		<1.5		<1.5		<0.77		<1.5		<1.5		<1.5		<0.77		<1.5		<0.77		<0.77	
		10/19/2006	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		10/16/2007	<0.43		<0.43		<0.86		<0.86		<0.86		<0.86		<0.43		<0.86		<0.86		<0.86		<0.43		<0.86		<0.43		<0.43	
		10/27/2008	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		5/4/2009	<0.17		<0.34		<0.34		<0.34		<0.34		<0.34		<0.17		<0.34		<0.34		<0.34		<0.17		<0.42		<0.17		<0.17	
		10/27/2009	<0.17		<0.33		<0.33		<0.33		<0.33		<0.33		<0.17		<0.33		<0.33		<0.33		<0.17		<0.42		<0.17		<0.17	
		4/12/2010	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		10/27/2010	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		4/15/2011	<0.33		<0.63		<0.63		<0.63		<0.63		<0.63		<0.33		<0.63		<0.63		<0.63		<0.33		<0.79		<0.33		0.62	
		10/11/2011	<0.21		<0.21		<0.21		<0.41		<0.41		<0.41		<0.21		<0.41		<0.41		<0.41		<0.21		<0.52		<0.21		<0.21	
		4/11/2012	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		10/29/2012	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		4/13/2013	<0.4		<0.4		<0.2		<0.2		<0.2		<0.4		<0.4		<0.4		<0.4		<1		<0.2		<0.24		<1		<0.4	
		10/19/2013	<0.42		<0.32		<0.21		<0.21		<0.21		<0.42		<0.42		<0.42		<0.42		<1.1		<0.21		<0.25		<1.1		<0.42	
		10/28/2014	<0.4		<0.4		<0.2		<0.2		<0.2		<0.4		<0.4		<0.4		<0.4		<0.99		<0.2		<0.24	U / UJ	<0.99		<0.4	
		12/9/2014	<0.37		<0.37		<0.19		<0.19	U / UJ	<0.19		<0.37		<0.37		<0.37		<0.37		<0.94		<0.19		<0.22		<0.94		<0.37	
		8/26/2015	<1.0		<0.30		<0.30		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/20/2015	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		4/19/2016	< 1.0	/UJ	< 0.30	/UJ	< 0.30	/UJ	< 1.0	/UJ	< 1.0	/UJ	< 1.0	/UJ	< 1.0	/UJ	< 1.0	/UJ	< 1.0	/UJ	< 1.0	/UJ	< 1.0	/UJ	< 1.0	/UJ	< 1.0	/UJ	< 1.0	/UJ
		10/10/2016	<1.0		<0.30	/ UJ	<0.30		<1.0	/ UJ	<1.0		<1.0		<1.0		<1.0	/ UJ	<1.0	/ UJ	<1.0		<1.0		<1.0		<1.0		<1.0	
		4/22/2017	<1.0	/ UJ	<0.30	/ UJ	<0.30	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ
		10/3/2017	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		4/10/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		10/1/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
	WES3	10/25/2005	<0.62		<0.62		<1.2		<1.2		1.4		<1.2		<0.62		<1.2		<1.2		<1.2		0.76		<1.2		0.86		2	
		5/5/2006	<0.39		<0.39		<0.78		<0.78		0.8		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		0.47		0.9	
		10/19/2006	<0.41		<0.41		<0.82		1.2		1.6		<0.82		<0.41		<0.82		<0.82		<0.82		1.9		<0.82		0.43		2.6	
		5/1/2007	<0.39		<0.39		<0.78		<0.78		1		<0.78		<0.39		<0.78		<0.78		<0.78		0.93		<0.78		1		3.2	
		10/16/2007	<0.39		<0.39		<0.78		0.91		1.4		<0.78		<0.39		<0.78		<0.78		<0.78		1		<0.78		<0.39		1.6	
		5/14/2008	<0.39		<0.39		<0.78		<0.78		0.82		<0.78		<0.39		<0.78		<0.78		<0.78		0.61		<0.78		<0.39		1.3	
		10/27/2008	<0.39		<0.39		<0.78		<0.78		0.81		<0.78		<0.39		<0.78		<0.78		<0.78		0.72		<0.78		<0.39		0.44	
		5/4/2009	<0.17		<0.32		<0.32		<0.32		0.89		<0.32		<0.17		<0.32		<0.32		<0.32		0.69		<0.4		<0.17		1.3	
		5/4/2009 (DUP)	<0.18		<0.35		<0.35		<0.35		0.9		<0.35		<0.18		<0.35		<0.35		<0.35		0.7		<0.44		<0.18		1.3	
		10/27/2009	<0.19		<0.37		<0.37		0.59		0.85		0.21	F / J	<0.19		<0.37		<0.37		<0.37		0.34		<0.47		<0.19		0.65	
		4/13/2010	<0.20		<0.39		<0.39		<0.39		<0.39		<0.39		<0.20		<0.39		<0.39		<0.39		0.58		<0.49		<0.20		1.2	
		10/27/2010	<0.19		<0.38		<0.38		0.8		1.1		<0.38		<0.19		<0.38		<0.38		<0.38		0.53		<0.47		0.23		0.99	
		4/15/2011	<0.41		<0.79		<0.79		0.69	F /	1.2		<0.79		<0.41		<0.79		<0.79		<0.79		0.57		<0.99		0.38	F /	2.3	
		10/11/2011	<0.20		<0.20		<0.20		<0.39		<0.39		0.12	F /	<0.20		<0.39		<0.39		<0.39		0.41		<0.49		<0.20		0.9	
		4/11/2012	<0.16		<0.31		<0.31		0.67		1		<0.31		<0.16		<0.31		<0.31		<0.31		0.74		<0.39		0.2		1.2	
		10/29/2012	<0.16		<0.31		<0.31		0.82		0.95		<0.31		<0.16		<0.31		<0.31		<0.31		0.43		<0.39		<0.16		0.76	
		4/13/2013	<0.37	U / UJ	<0.37	U / UJ	<0.18	U / UJ	0.29	/ J	0.3	/ J	<0.37	U / UJ	<0.37	U / UJ	<0.37	U / UJ	<0.37	U / UJ	<0.91	U / UJ	0.11	F / J	<0.22	U / UJ	<0.91	U / UJ	0.23	F / J
		10/19/2013	<0.42		<0.32		<0.21		0.84		0.96		<0.42		<0.42		<0.42		<0.42		<1.1		0.34	/ J	<0.25		<1.1		0.74	
		10/27/2014	<0.37		<0.37		<0.18		0.77		1		<0.37		<0.37		<0.37		<0.37		<0.92		<0.18		<0.22	U / UJ	<0.92		0.95	
		12/9/2014	<0.38		<0.38		<0.19		0.71	/ J	0.89		<0.38		<0.38		<0.38		<0.38		<0.96		0.5		<0.23		<0.96		0.85	
		8/26/2015	<1.0		<0.30		<0.30		0.58	J	0.81	J	<1.0		<1.0		<1.0		<1.0		<1.0		0.38	J	<1.0		<1.0		0.88	J
		10/20/2015	<1		<0.3		<0.3		<1		0.62	J /	<1		<1		<1		<1		<1		<1		<1		0.18	J /	0.68	J /
		4/18/2016	< 1.0		< 0.30		< 0.30		0.54	J/	0.82	J/	< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		0.4	J/	< 1.0		0.19	J/	1.1	
		10/10/2016	<1.0		<0.30	/ UJ	<0.30		0.65	J / J	0.93	J /	<1.0		<1.0		<1.0	/ UJ	<1.0	/ UJ	<1.0		0.71	J /	<1.0		<1.0		1.3	
		4/25/2017	<1.0		<0.30		<0.30		<1.0		0.61	J /	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0		<1.0		0.47	J /	<1.0		<1.0		0.99	J /
		10/3/2017	<1		<0.3		<0.3		0.51	J /	0.8	J /	<1		<1		<1		<1		<1		0.36	J /	<1		<1		0.57	J /
		4/10/2018	<1		<0.3		<0.3		0.41	J /	0.67	J /	<1	/ UJ	<1		<1		<1		<1		0.35	J / J	<1		<1		0.92	J /
		10/1/2018	<1		<0.3		<0.3		0.62	J /	0.87	J /	<1		<1		<1		<1		<1		0.4	J / J	<1		<1		0.87	J /
		Compliance																												
	SW550	10/24/2005	<0.48		<0.48		<0.96		<0.96		<0.96		<0.96		<0.48		<0.96		<0.96		<0.96		<0.48		<0.96		<0.48		<0.48	
		5/5/2006	<0.42		<0.42		<0.83		<0.83		<0.83		<0.83		<0.42		<0.83		<0.83		<0.83		<0.42		<0.83		<0.42		<0.42	
		10/17/2006	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		4/27/2007	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		4/27/2007 (DUP)	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		10/17/2007	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		5/19/2008	<0.45		<0.45		<0.9		<0.9		<0.9		<0.9		<0.45		<0.9		<0.9		<0.9		<0.45		<0.9		<0.45		<0.45	
		10/23/2008	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		5/1/2009	<0.16		<0.32		<0.32		<0.32		<0.32		<0.32		<0.16		<0.32		<0.32		<0.32		<0.16		<0.4		<0.16		<0.16	
		10/27/2009	<0.16		<0.32		<0.32		<0.32		<0.32		<0.32		<0.16		<0.32		<0.32		<0.32		<0.16		<0.4		<0.16		<0.16	
		4/14/2010	<0.20		<0.38		<0.38		<0.38		<0.38		<0.38		<0.20		<0.38		<0.38		<0.38		<0.20		<0.48		<0.20		<0.20	
		10/27/2010	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		4/14/2011	<0.26		<0.5		<0.5		<0.5		<0.5		<0.5		<0.26		<0.5		<0.5		<0.5		<0.26		<0.62		<0.26		<0.26	
		10/11/2011	<0.36		<0.36		<0.36		<0.69		<0.69		<0.69		<0.36		<0.69		<0.69		<0.69		<0.36		<0.87		<0.36		<0.36	
		4/12/2012	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		10/30/2012	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		4/14/2013	<0.42		<0.42		<0.21		<0.21		<0.21		<0.42		<0.42		<0.42		<0.42		<1.1		<0.21		<0.25		<1.1		<0.42	
		10/19/2013	<0.43		<0.32		<0.22		<0.22		<0.22		<0.43		<0.43		<0.43		<0.43		<1.1		<0.22		<0.26		<1.1		<0.43	
		10/28/2014	<0.37		<0.37		<0.19		<0.19		<0.19		<0.37		<0.37		<0.37		<0.37		<0.94		<0.19		<0.22	U / UJ	<0.94		<0.37	
		12/9/2014	<0.38		<0.38		<0.19		<0.19	U / UJ	<0.19		<0.38		<0.38		<0.38		<0.38		<0.94		<0.19		<0.23		<0.94		<0.38	
		8/24/2015	<1.0	/ UJ	<0.30	/ UJ	<0.30	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ
		10/20/2015	<1	/ UJ	<0.3	/ UJ	<0.3	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ
		4/18/2016	< 1.0		< 0.30		< 0.30		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0	
		10/10/2016	<1.0		<0.30	/ UJ	<0.30		<1.0	/ UJ	<1.0		<1.0		<1.0		<1.0	/ UJ	<1.0	/ UJ	<1.0		<1.0		<1.0		<1.0		<1.0	
		4/25/2017	<1.0	/ UJ	<0.30	/ UJ	<0.30	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ
		10/3/2017	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		4/9/2018	<1.3		<0.4		<0.4		<1.3		<1.3		<1.3	/ UJ	<1.3		<1.3		<1.3		<1.3		<1.3		<1.3	/ UJ	<1.3		<1.3	
		10/1/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	

TABLE B1

Summary of Analytical Results - Explosives
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	1,3-DNB		2,4-DNT		2,6-DNT		2-A-4,6-DNT		4-A-2,6-DNT		HMX		NB		2-NT		3-NT		4-NT		RDX		Tetryl		1,3,5-TNB		2,4,6-TNT	
		Units	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
		Project Action Limit[1]	10		0.42		0.42		NS		NS		5100		51		5100		NS		NS		2.6		200		5.1		9.5	
		Surface Water RG[2]	4		330		150		NS		NS		260		8000		62		NS		NS		500		NS		15		75	
Site	Well	Date	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF
		In-Plume																												
L2[3]	MW404	10/13/2006	<0.64		<0.64		<1.3		<1.3		<1.3		78		<0.64		<1.3		<1.3		<1.3		**270**		<1.3		<0.64		<0.64	
		4/27/2007	<0.39		<0.39		<0.78		<0.78		<0.78		21		<0.39		<0.78		<0.78		<0.78		**45**		<0.78		<0.39		<0.39	
		10/17/2007	<0.39		<0.39		<0.78		<0.78		<0.78		52		<0.39		<0.78		<0.78		<0.78		**250**		<0.78		<0.39		<0.39	
		5/19/2008	<0.39		<0.39		<0.78		<0.78		<0.78		32		<0.39		<0.78		<0.78		<0.78		**110**		<0.78		<0.39		<0.39	
		10/23/2008	<0.49		<0.49		<0.99		<0.99		<0.99		32		<0.49		<0.99		<0.99		<0.99		**120**		<0.99		<0.49		<0.49	
		5/1/2009	<0.21		<0.41		<0.41		<0.41		<0.41		11		<0.21		<0.41		<0.41		<0.41		**16**		<0.51		<0.21		<0.21	
		10/26/2009	<0.3		<0.58		<0.58		<0.58		<0.58		15		<0.3		<0.58		<0.58		<0.58		**27**		<0.73		<0.3		<0.3	
		4/12/2010	<0.16		<0.31		<0.31		<0.31		<0.31		15		<0.16		<0.31		0.086	F /	<0.31		**27**		<0.39		<0.16		<0.16	
		10/27/2010	<0.18		<0.35		<0.35		<0.35		<0.35		28		<0.18		<0.35		<0.35		<0.35		**46**		<0.44		<0.18		<0.18	
		4/14/2011	<0.21		<0.4		<0.4		<0.4		<0.4		24		<0.21		<0.4		<0.4		<0.4		**74**		<0.5		<0.21		<0.21	
		10/11/2011	<0.22		<0.22		<0.22		<0.42		<0.42		30		<0.22		<0.42		<0.42		<0.42		**94**		<0.53	U / UJ	<0.22	U / UJ	<0.22	U / UJ
		10/26/2012	<0.16		0.21	F /	<0.31		<0.31		<0.31		33		<0.16		0.54	/ J	<0.31		0.65	/ J	**130**		<0.39		<0.16		<0.16	
		10/18/2013	<0.42		<0.32		<0.21		<0.21		<0.21		26		<0.42		<0.42		<0.42		<1.1		**84**		<0.25		<1.1		<0.42	
		12/10/2014	<4.1		<4.1		<2.1		<2.1		<2.1		27		<4.1		<4.1		<4.1		<10		**93**		<2.5		<10		<0.41	
		10/20/2015	<1		<0.3		<0.3		<1		<1		19		<1		<1		<1		<1		**61**		<1		<1		<1	
		10/8/2016	<1.0		<0.30	/ UJ	<0.30		<1.0	/ UJ	<1.0		25		<1.0		<1.0	/ UJ	<1.0	/ UJ	<1.0		**66**		<1.0		<1.0		<1.0	
		10/7/2017	<1		<0.3		<0.3		<1		<1		21		<1		<1		<1		<1		**51**		<1		<1		<1	
		10/4/2018	<1		<0.3		<0.3		<1		<1		14		<1		<1		<1		<1		**28**		<1		<1		<1	
		10/4/2018 (DUP)	<1		<0.3		<0.3		<1		<1		14		<1		<1		<1		<1		**28**		<1		<1		<1	
	MW620	10/13/2006	<0.48		<0.48		<0.96		<0.96		<0.96		<0.96		<0.48		<0.96		<0.96		<0.96		<0.48		<0.96		<0.48		<0.48	
		4/27/2007	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		10/17/2007	<0.55		<0.55		<1.1		<1.1		<1.1		<1.1		<0.55		<1.1		<1.1		<1.1		<0.55		<1.1		<0.55		<0.55	
		5/19/2008	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		10/23/2008	<0.45		<0.45		<0.9		<0.9		<0.9		<0.9		<0.45		<0.9		<0.9		<0.9		<0.45		<0.9		<0.45		<0.45	
		5/1/2009	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		10/26/2009	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		4/8/2010	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		10/27/2010	<0.22		<0.43		<0.43		<0.43		<0.43		<0.43		<0.22		<0.43		<0.43		<0.43		<0.22		<0.55		<0.22		<0.22	
		4/14/2011	<0.43		<0.84		<0.84		<0.84		<0.84		<0.84		<0.43		<0.84		<0.84		<0.84		<0.43		<1.1		<0.43		<0.43	
		10/11/2011	<0.32		<0.32		<0.32		<0.61		<0.61		<0.61		<0.32		<0.61		<0.61		<0.61		<0.32		<0.77		<0.32		<0.32	U / UJ
		10/26/2012	<0.16		0.29	F /	0.13	F /	<0.31		<0.31		<0.31		<0.16		0.28	F /	<0.31		1.5	/ J	<0.16		<0.39		<0.16		<0.16	
		10/18/2013	<0.41		<0.31		<0.21		<0.21		<0.21		<0.41		<0.41		<0.41		<0.41		<1		<0.21		<0.25		<1		<0.41	
		12/10/2014	<0.39		<0.39		<0.19		<0.19		<0.19		<0.39		<0.39		<0.39		<0.39		<0.97		<0.19		<0.23	U / UJ	<0.97		<0.39	
		10/20/2015	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		10/8/2016	<1.0		<0.30	/ UJ	<0.30		<1.0	/ UJ	<1.0		<1.0		<1.0		<1.0	/ UJ	<1.0	/ UJ	<1.0		<1.0		<1.0		<1.0		<1.0	
		10/7/2017	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		10/4/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		Compliance																												
	MW621	10/13/2006	<0.57		<0.57		<1.1		<1.1		<1.1		<1.1		<0.57		<1.1		<1.1		<1.1		<0.57		<1.1		<0.57		<0.57	
		10/13/2006 (DUP)	<0.46		<0.46		<0.91		<0.91		<0.91		<0.91		<0.46		<0.91		<0.91		<0.91		<0.46		<0.91		<0.46		<0.46	
		4/27/2007	<0.48		<0.48		<0.96		<0.96		<0.96		<0.96		<0.48		<0.96		<0.96		<0.96		<0.48		<0.96		<0.48		<0.48	
		10/17/2007	<0.74		<0.74		<1.5		<1.5		<1.5		<1.5		<0.74		<1.5		<1.5		<1.5		<0.74		<1.5		<0.74		<0.74	
		10/17/2007 (DUP)	<0.69		<0.69		<1.4		<1.4		<1.4		<1.4		<0.69		<1.4		<1.4		<1.4		<0.69		<1.4		<0.69		<0.69	
		5/19/2008	<0.59		<0.59		<1.2		<1.2		<1.2		<1.2		<0.59		<1.2		<1.2		<1.2		<0.59		<1.2		<0.59		<0.59	
		10/23/2008	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		5/1/2009	<0.16		<0.31		<0.31		<0.31		<0.31		2.5		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		10/26/2009	<0.2		<0.38		<0.38		<0.38		<0.38		<0.38		<0.2		<0.38		<0.38		<0.38		<0.2		<0.48		<0.2		<0.2	
		4/8/2010	<0.21		<0.40		<0.40		<0.40		<0.40		<0.40		<0.21		<0.40		<0.40		<0.40		<0.21		<0.51		<0.21		<0.21	
		10/27/2010	<0.19		<0.37		<0.37		<0.37		<0.37		<0.37		<0.19		<0.37		<0.37		<0.37		<0.19		<0.46		<0.19		<0.19	
		4/14/2011	<0.32		<0.61		<0.61		<0.61		<0.61		0.58	F /	<0.32		<0.61		<0.61		<0.61		0.18	F /	<0.77		<0.32		<0.32	
		10/11/2011	<0.27		<0.27		<0.27		<0.52		<0.52		<0.52		<0.27		<0.52		<0.52		<0.52		<0.27		<0.65		<0.27		<0.27	U / UJ
		10/26/2012	<0.16		0.42		<0.31		<0.31		<0.31		<0.31		<0.16		0.24	F /	<0.31		0.4		<0.16		<0.39		<0.16		<0.16	
		10/18/2013	<0.43		<0.32		<0.21		<0.21		<0.21		<0.43		<0.43		<0.43		<0.43		<1.1		<0.21		<0.26		<1.1		<0.43	
		12/10/2014	<0.39		<0.39		<0.19		<0.19		<0.19		<0.39		<0.39		<0.39		<0.39		<0.97		<0.19		<0.23	U / UJ	<0.97		<0.39	
		10/20/2015	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		10/8/2016	<1.0		<0.30	/ UJ	<0.30		<1.0	/ UJ	<1.0		<1.0		<1.0		<1.0	/ UJ	<1.0	/ UJ	<1.0		<1.0		<1.0		<1.0		<1.0	
		10/7/2017	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		10/4/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
	SW555	10/13/2006	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		4/27/2007	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		10/17/2007	<0.49		<0.49		<0.98		<0.98		<0.98		<0.98		<0.49		<0.98		<0.98		<0.98		<0.49		<0.98		<0.49		<0.49	
		10/17/2007 (DUP)	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		5/19/2008	<0.71		<0.71		<1.4		<1.4		<1.4		<1.4		<0.71		<1.4		<1.4		<1.4		<0.71		<1.4		<0.71		<0.71	
		10/23/2008	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		10/23/2008 (DUP)	<0.4		<0.4		<0.79		<0.79		<0.79		<0.79		<0.4		<0.79		<0.79		<0.79		<0.4		<0.79		<0.4		<0.4	
		5/1/2009	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		10/26/2009	<0.2		<0.38		<0.38		<0.38		<0.38		<0.38		<0.2		0.3	F /	<0.38		<0.38		<0.2		<0.48		<0.2		<0.2	
		4/8/2010	<0.21		<0.40		<0.40		<0.40		<0.40		<0.40		<0.21		<0.40		<0.40		<0.40		<0.21		<0.50		<0.21		<0.21	
		10/27/2010	<0.19		<0.36		<0.36		<0.36		<0.36		<0.36		<0.19		<0.36		<0.36		<0.36		<0.19		<0.46		<0.19		<0.19	
		4/14/2011	<0.17		<0.32		<0.32		<0.32		<0.32		<0.32		<0.17		<0.32		<0.32		<0.32		<0.17		<0.4		<0.17		<0.17	
		10/11/2011	<0.25		<0.25		<0.25		<0.49		<0.49		<0.49		<0.25		<0.49		<0.49		<0.49		<0.25		<0.62		<0.25		<0.25	U / UJ
		10/26/2012	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		10/18/2013	<0.43		<0.33		<0.22		<0.22		<0.22		<0.43		<0.43		<0.43		<0.43		<1.1		<0.22		<0.26		<1.1		<0.43	
		12/10/2014	<0.38		<0.38		<0.19		<0.19		<0.19		<0.38		<0.38		<0.38		<0.38		<0.95		<0.19		<0.23	U / UJ	<0.95		<0.38	
		10/20/2015	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		10/8/2016	<1.0		<0.30	/ UJ	<0.30		<1.0	/ UJ	<1.0		<1.0		<1.0		<1.0	/ UJ	<1.0	/ UJ	<1.0		<1.0		<1.0		<1.0		<1.0	
		10/7/2017	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		10/4/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	

TABLE B1

Summary of Analytical Results - Explosives
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	**1,3-DNB**		**2,4-DNT**		**2,6-DNT**		**2-A-4,6-DNT**		**4-A-2,6-DNT**		**HMX**		**NB**		**2-NT**		**3-NT**		**4-NT**		**RDX**		**Tetryl**		**1,3,5-TNB**		**2,4,6-TNT**	
		Units	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
		Project Action Limit[1]	10		0.42		0.42		NS		NS		5100		51		5100		NS		NS		2.6		200		5.1		9.5	
		Surface Water RG[2]	4		330		150		NS		NS		260		8000		62		NS		NS		500		NS		15		75	
Site	**Well**	**Date**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**
	In-Plume																													
	MW412	5/21/2008	<0.39		<0.39		<0.78		1.2		1.8		51		<0.39		<0.78		<0.78		<0.78		**440**		<0.78		<0.39		<0.39	
		10/29/2008	<0.44		<0.44		<0.88		0.98		1.7		34		<0.44		<0.88		<0.88		<0.88		**170**		<0.88		<0.44		<0.44	
		10/29/2008 (DUP)	<0.4		<0.4		<0.79		1.1		1.8		42		<0.4		<0.79		<0.79		<0.79		**250**		<0.79		<0.4		<0.4	
		5/6/2009	<0.16		<0.31		<0.31		0.93		1.4		35		<0.16		<0.31		<0.31		<0.31		**210**		<0.39		<0.16		<0.16	
		10/27/2009	<0.17		<0.33		<0.33		0.96		1.6		30	/ J	<0.17		<0.33		<0.33		<0.33		**130**		<0.42		<0.17		<0.17	
		4/12/2010	<0.18		<0.35		<0.35		1		1.6		38		<0.18		<0.35		<0.35		<0.35		**220**		<0.44		<0.18		<0.18	
		10/26/2010	<0.23		<0.45		<0.45		1.3		1.8		29		<0.23		<0.45		<0.45		<0.45		**200**		<0.57		<0.23		<0.23	
		4/14/2011	<0.28		<0.54		<0.54		0.94		<0.54		26		<0.28		<0.54		<0.54		<0.54		**110**		<0.68		<0.28		<0.28	
		10/17/2011	<0.22		<0.22		<0.22		<0.42		<0.42		19		<0.22		<0.42		<0.42		<0.42		**67**		<0.53		<0.22		<0.22	U / UJ
		4/11/2012	<0.16		<0.31		<0.31		0.89		1.7		28	/ J	0.24		<0.31		<0.31		<0.31		**120**		<0.39		0.11	F / J	<0.16	
		10/30/2012	<0.16		<0.31		<0.31		<0.31		1.9		26		<0.16		<0.31		<0.31		<0.31		**120**		<0.39		<0.16		<0.16	
		4/15/2013	<0.39	U / UJ	<0.39	U / UJ	<0.19	U / UJ	0.38	/ JJ	0.51	/ JJ	20	/ JJ	<0.39	U / UJ	<0.39	U / UJ	<0.39	U / UJ	<0.97	U / UJ	**74**	/ JJ	<0.23	U / UJ	<0.97	U / UJ	<0.39	U / UJ
		10/21/2013	<0.38		<0.28		<0.19		1.1	/ J	1.5	/ J	30	/ J	<0.38		<0.38		<0.38		<0.95		**140**	/ J	<0.23		<0.95		<0.38	
		10/21/2013 (DUP)	<0.38		<0.28		<0.19		0.83	/ J	1.1	/ J	27	/ J	<0.38		<0.38		<0.38		<0.94		**120**	/ J	<0.23		<0.94		<0.38	
		10/23/2014	<0.4		<0.4		<0.2		0.91		1.4		29		<0.4		<0.4		<0.4		<0.99		**85**		<0.24	U / UJ	<0.99		<0.4	
		12/10/2014	<3.9		<0.39		<0.19		0.72	/ J	<1.9		24	/ J	<0.39		<0.39		<0.39		<0.97		**85**	/ J	<0.23		<0.97		<0.39	
		8/25/2015	<1.0		<0.30		<0.30		<1.0		0.54	J	11		<1.0		<1.0		<1.0		<1.0		**36**		<1.0		<1.0		<1.0	
		10/21/2015	<1		<0.3		<0.3		<1		0.61	J /	12		<1		<1		<1		<1		**32**		<1		<1		<1	
		4/20/2016	< 1.0		< 0.30		< 0.30		< 1.0		< 1.0		19		< 1.0		< 1.0		< 1.0		< 1.0		**45**		< 1.0		< 1.0		< 1.0	
		4/20/2016 (DUP)	< 1.0		< 0.30		< 0.30		< 1.0		< 1.0		19		< 1.0		< 1.0		< 1.0		< 1.0		**47**		< 1.0		< 1.0		< 1.0	
		10/8/2016	<1.0		<0.30		<0.30		<1.0		0.58	J /	12		<1.0		<1.0	/ UJ	<1.0	/ UJ	<1.0		**31**		<1.0		<1.0		<1.0	
		4/22/2017	<1.0	/ UJ	<0.31	/ UJ	<0.31	/ UJ	0.37	J / J	0.62	J / J	14	/ J	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	**38**	/ J	<1.0	/ UJ	<1.0	H / UJ	<1.0	/ UJ
		10/7/2017	<1		<0.3		<0.3		0.81	J /	1.2		17		<1		<1		<1		<1		**63**		<1		<1		<1	
		10/7/2017 (DUP)	<1		<0.3		<0.3		0.77	J /	1.1		16		<1		<1		<1		<1		**62**		<1		<1		<1	
		4/18/2018	<1		<0.3		<0.3		0.36	J /	<1		15	/ J	<1		<1		<1		<1		**43**		<1		<1		<1	
		4/18/2018 (DUP)	<1		<0.3		<0.3		0.41	J /	0.67	J /	14	/ J	<1		<1		<1		<1		**44**		<1		<1		<1	
		10/6/2018	<1		<0.3		<0.3		0.87	J /	1		16		<1		<1		<1		<1		**61**		<1		<1		<1	
		10/6/2018 (DUP)	<1		<0.3		<0.3		0.85	J /	1.2		17		<1		<1		<1		<1		**62**		<1		<1		<1	
	Early Warning																													
L3	MW630	5/20/2008	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		0.83		<0.78		<0.39		<0.39	
		10/28/2008	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		5/6/2009	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		10/26/2009	<0.16		<0.32		<0.32		<0.32		<0.32		0.83	/ J	<0.16		<0.32		<0.32		<0.32		0.96		<0.4		<0.16		<0.16	
		4/9/2010	<0.25		<0.49		<0.49		<0.49		<0.49		3.7	/ J	<0.25		<0.49		<0.49		<0.49		**8.9**		<0.62		<0.25		<0.25	
		4/9/2010 (DUP)	<0.18		<0.35		<0.35		<0.35		<0.35		4.8	/ J	<0.18		<0.35		<0.35		<0.35		**11**		<0.44		<0.18		<0.18	
		10/26/2010	<0.57		<1.1		<1.1		<1.1		<1.1		<1.1		<0.57		<1.1		<1.1		<1.1		<0.57		<1.4		<0.57		<0.57	
		4/14/2011	<0.26		<0.5		<0.5		<0.5		<0.5		6.6		<0.26		<0.5		<0.5		<0.5		**13**		<0.62		<0.26		<0.26	
		10/14/2011	<0.45		<0.45		<0.45		<0.88		<0.88		4		<0.45		<0.88		<0.88		<0.88		**8**		<1.1		<0.45		<0.45	
		10/14/2011 (DUP)	<0.22		<0.22		<0.22		<0.43		<0.43		4.6		<0.22		<0.43		<0.43		<0.43		**7.8**		<0.54		<0.22		<0.22	
		4/11/2012	<0.16		<0.31		<0.31		0.077	F / J	0.18	F / J	4.7	/ J	<0.16		<0.31		<0.31		<0.31		**8.7**		<0.39		<0.16		<0.16	
		4/11/2012 (DUP)	<0.16		<0.31		<0.31		0.072	F / J	0.15	F / J	4.7	/ J	<0.16		<0.31		<0.31		<0.31		**8.7**		<0.39		<0.16		<0.16	
		10/30/2012	<0.16		<0.31		<0.31		<0.31		<0.31		0.35		<0.16		<0.31		<0.31		<0.31		0.36		<0.39		<0.16		<0.16	
		4/16/2013	<0.39		<0.39		<0.19		0.1	F / J	0.17	F / J	4.5		<0.39	U /	<0.39	U /	<0.39		<0.97	U /	**6.1**		<0.23		<0.97		<0.39	
		10/21/2013	<0.38		<0.29		<0.19		<0.19		<0.19		0.79		<0.38		<0.38		<0.38		<0.95		0.66		<0.23		<0.95		<0.38	
		10/21/2013 (DUP)	<0.38		<0.29		<0.19		<0.19		<0.19		0.78		<0.38		<0.38		<0.38		<0.96		0.66		<0.23		<0.96		<0.38	
		10/23/2014	<0.38		<0.38		<0.19		<0.19		<0.19		2.4		<0.38		<0.38	U / UJ	<0.38		<0.95		**3.5**		<0.23	U / UJ	<0.95		<0.38	
		10/23/2014 (DUP)	<0.4		<0.4		<0.2		<0.2	U / UJ	<0.2		2.2		<0.4		<0.4		<0.4		<1		**3.4**		<0.24	U / UJ	<1		<0.4	
		12/10/2014	<0.4		<0.4		<0.2		<0.2	U / UJ	<0.2		2.8		<0.4		<0.4		<0.4		<0.99		**5**		<0.24		<0.99		<0.4	
		12/10/2014 (DUP)	<0.39		<0.39		<0.2		<0.2	U / UJ	<0.2		3		<0.39		<0.39		<0.39		<0.99		**5.4**		<0.24		<0.99		<0.39	
		8/25/2015	<1.0		<0.30		<0.30		<1.0		<1.0		3.7		<1.0		<1.0		<1.0		<1.0		**6.8**		<1.0		<1.0		<1.0	
		8/25/2015 (DUP)	<1.0	/ UJ	<0.30	/ UJ	<0.30	/ UJ	<1.0	/ UJ	<1.0	/ UJ	3.3	/ J	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	**6**	/ J	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ
		10/21/2015	<1		<0.3		<0.3		<1		<1		2.1		<1		<1		<1		<1		**4.1**		<1		<1		<1	
		4/20/2016	< 1.0		< 0.30		< 0.30		< 1.0		< 1.0		4.7		< 1.0		< 1.0		< 1.0		< 1.0		**8.6**		< 1.0		< 1.0		< 1.0	
		10/8/2016	<1.0		<0.30		<0.30		<1.0		<1.0		3.1		<1.0		<1.0	/ UJ	<1.0	/ UJ	<1.0		**4.4**		<1.0		<1.0		<1.0	
		4/22/2017	<1.1	/ UJ	<0.32	/ UJ	<0.32	/ UJ	<1.1	/ UJ	<1.1	/ UJ	4.3	/ J	<1.1	/ UJ	<1.1	/ UJ	<1.1	/ UJ	<1.1	/ UJ	**6.4**	/ J	<1.1	/ UJ	<1.1	/ UJ	<1.1	/ UJ
		10/7/2017	<1		<0.3		<0.3		<1		<1		2.4		<1		<1		<1		<1		**4.1**		<1		<1		<1	
		10/75/2017 (DUP)	<1		<0.3		<0.3		<1		<1		3.1		<1		<1		<1		<1		**5.6**		<1		<1		<1	
		4/18/2018	<1		<0.3		<0.3		<1		<1		1.8	/ J	<1		<1		<1		<1		**3.3**		<1		<1		<1	
		10/6/2018	<1		<0.3		<0.3		<1		<1		1.4		<1		<1		<1		<1		2.5		<1		<1		<1	

TABLE B1

Summary of Analytical Results - Explosives
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	**1,3-DNB**	**2,4-DNT**	**2,6-DNT**	**2-A-4,6-DNT**	**4-A-2,6-DNT**	**HMX**	**NB**	**2-NT**	**3-NT**	**4-NT**	**RDX**	**Tetryl**	**1,3,5-TNB**	**2,4,6-TNT**
		Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
		Project Action Limit[1]	10	0.42	0.42	NS	NS	5100	51	5100	NS	NS	2.6	200	5.1	9.5
		Surface Water RG[2]	4	330	150	NS	NS	260	8000	62	NS	NS	500	NS	15	75
Site	**Well**	**Date**	**Result LF/VF**	**Result LF/VF**	**Result LF/VF**	**Result LF/VF**	**Result LF/VF**	**Result LF/VF**	**Result LF/VF**	**Result LF/VF**	**Result LF/VF**	**Result LF/VF**	**Result LF/VF**	**Result LF/VF**	**Result LF/VF**	**Result LF/VF**
L3	MW631	***Early Warning***														
		5/20/2008	<0.49	<0.49	<0.99	<0.99	<0.99	<0.99	<0.49	<0.99	<0.99	<0.99	<0.49	<0.99	<0.49	<0.49
		10/28/2008	<0.39	<0.39	<0.78	<0.78	<0.78	<0.78	<0.39	<0.78	<0.78	<0.78	<0.39	<0.78	<0.39	<0.39
		5/6/2009	<0.27	<0.53	<0.53	<0.53	<0.53	<0.53	<0.27	<0.53	<0.53	<0.53	<0.27	<0.66	<0.27	<0.27
		10/26/2009	<0.16	<0.31	<0.31	<0.31	<0.31	<0.31	<0.16	<0.31	<0.31	<0.31	<0.16	<0.39	<0.16	<0.16
		4/9/2010	<0.24	<0.46	<0.46	<0.46	<0.46	<0.46	<0.24	<0.46	<0.46	<0.46	<0.24	<0.58	<0.24	<0.24
		10/26/2010	<0.16	<0.31	<0.31	<0.31	<0.31	<0.31	<0.16	<0.31	<0.31	<0.31	<0.16	<0.39	<0.16	<0.16
		4/14/2011	<0.23	<0.45	<0.45	<0.45	<0.45	<0.45	<0.23	<0.45	<0.45	<0.45	<0.23	<0.57	<0.23	<0.23
		10/14/2011	<0.23	<0.23	<0.23	<0.44	<0.44	<0.44	<0.23	<0.44	<0.44	<0.44	<0.23	<0.56	<0.23	<0.23
		4/11/2012	<0.16	<0.31	<0.31	<0.31	<0.31	<0.31	<0.16	<0.31	<0.31	<0.31	<0.16	<0.39	<0.16	<0.16
		10/30/2012	<0.16	<0.31	<0.31	<0.31	<0.31	<0.31	<0.16	<0.31	<0.31	<0.31	<0.16	<0.39	<0.16	<0.16
		10/30/2012 (DUP)	<0.16	<0.31	<0.31	<0.31	<0.31	<0.31	<0.16	<0.31	<0.31	<0.31	<0.16	<0.39	<0.16	<0.16
		4/16/2013	<0.39	<0.39	<0.19	<0.19	<0.19	<0.39 U /	<0.39 U /	<0.39 U /	<0.39	<0.96 U /	<0.19	<0.23	<0.96	<0.39
		10/21/2013	<0.38	<0.29	<0.19	<0.19	<0.19	<0.38	<0.38	<0.38	<0.38	<0.95	<0.19	<0.23	<0.95	<0.38
		10/21/2013 (DUP)	<0.39	<0.29	<0.19	<0.19	<0.19	<0.39	<0.39	<0.39	<0.39	<0.97	<0.19	<0.23	<0.97	<0.39
		10/23/2014	<0.38	<0.38	<0.19	<0.19	<0.19	<0.38	<0.38	<0.38	<0.38	<0.95	<0.19	<0.23 U / UJ	<0.95	<0.38
		10/23/2014 (DUP)	<0.38	<0.38	<0.19	<0.19	<0.19	<0.38	<0.38	<0.38	<0.38	<0.95	<0.19	<0.23 U / UJ	<0.95	<0.38
		12/10/2014	<0.38	<0.38	<0.19	<0.19 U / UJ	<0.19	<0.38	<0.38	<0.38	<0.38	<0.96	<0.19	<0.23	<0.96	<0.38
		12/10/2014 (DUP)	<0.38	<0.38	<0.19	<0.19 U / UJ	<0.19	<0.38	<0.38	<0.38	<0.38	<0.95	<0.19	<0.23	<0.95	<0.38
		8/25/2015	<1.0	<0.30	<0.30	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
		8/25/2015 (DUP)	<1.0	<0.30	<0.30	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
		10/21/2015	<1	<0.3	<0.3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
		4/20/2016	< 1.0	< 0.30	< 0.30	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
		10/8/2016	<1.0	<0.30	<0.30	<1.0	<1.0	<1.0	<1.0	<1.0 / UJ	<1.0 / UJ	<1.0	<1.0	<1.0	<1.0	<1.0
		4/22/2017	<1.1 / UJ	<0.33 / UJ	<0.33 / UJ	<1.1 / UJ	<1.1 / UJ	<1.1 / UJ	<1.1 / UJ	<1.1 / UJ	<1.1 / UJ	<1.1 / UJ	<1.1 / UJ	<1.1 / UJ	<1.1 / UJ	<1.1 / UJ
		10/7/2017	<1	<0.3	<0.3	<1	<1	<1	<1	<1 S / UJ	<1 S / UJ	<1	<1	<1	<1	<1
		4/18/2018	<1	<0.3	<0.3	<1	<1	<1 / UJ	<1	<1	<1	<1	<1	<1	<1	<1
		10/6/2018	<1	<0.3	<0.3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	MW633	***Early Warning***														
		5/21/2008	<0.39	<0.39	<0.78	1	1.7	47	<0.39	<0.78	<0.78	<0.78	**390**	<0.78	<0.39	<0.39
		5/21/2008 (DUP)	<0.39	<0.39	<0.78	0.88	1.4	43	<0.39	<0.78	<0.78	<0.78	**280**	<0.78	<0.39	<0.39
		10/29/2008	<0.4	<0.4	<0.81	<0.81	<0.81	1.1	<0.4	<0.81	<0.81	<0.81	**4.5**	<0.81	<0.4	<0.4
		5/6/2009	<0.17	<0.33	<0.33	<0.33	<0.33	5.7	<0.17	<0.33	<0.33	<0.33	**33**	<0.41	<0.17	<0.17
		10/27/2009	<0.16	<0.31	<0.31	<0.31	<0.31	2 / J	<0.16	<0.31	<0.31	<0.31	**7.7**	<0.39	<0.16	<0.16
		4/12/2010	<0.18	<0.34	<0.34	<0.34	<0.34	8.4	<0.18	<0.34	<0.34	<0.34	**56**	<0.43	<0.18	<0.18
		10/26/2010	<0.32	<0.61	<0.61	<0.61	<0.61	3.9	<0.32	<0.61	<0.61	<0.61	**16**	<0.77	<0.32	<0.32
		4/14/2011	<0.39	<0.76	<0.76	<0.76	<0.76	1.2	<0.39	<0.76	<0.76	<0.76	**4.2**	<0.96	<0.39	<0.39
		10/17/2011	<0.39	<0.39	<0.39	<0.76 U / UJ	<0.76	3.1	<0.39	<0.76	<0.76	<0.76	**7.9**	<0.96	<0.39	<0.39
		4/11/2012	<0.16	<0.31	<0.31	<0.31	<0.31	2 / J	<0.16	<0.31	<0.31	<0.31	**6.7**	<0.39	<0.16	<0.16
		10/30/2012	<0.16	<0.31	0.13 F / J	<0.31	<0.31	2.7	<0.16	<0.31	<0.31	<0.31	**10**	<0.39	<0.16	<0.16
		4/15/2013	<0.38 U / UJ	<0.38 U / UJ	<0.19 U / UJ	<0.19 U / UJ	<0.19 U / UJ	0.43 / J	<0.38 U / UJ	<0.38 U / UJ	<0.38 U / UJ	<0.94 U / UJ	1.6 / J	<0.23 U / UJ	<0.94 U / UJ	<0.38 U / UJ
		4/15/2013 (DUP)	<0.42	<0.42	<0.21	<0.21	<0.21	0.6	<0.42 U /	<0.42 U /	<0.42	<1 U /	2.4	<0.25	<1	<0.42
		10/21/2013	<0.37	<0.28	<0.19	<0.19	<0.19	2	<0.37	<0.37	<0.37	<0.93	**6.9**	<0.22	<0.93	<0.37
		10/23/2014	<0.37	<0.37	<0.18	<0.18	<0.18	1.3	<0.37	<0.37	<0.37	<0.92	**3.8**	<0.22 U / UJ	<0.92	<0.37
		12/10/2014	<0.38	<0.38	<0.19	<0.19 U / UJ	<0.19	0.97	<0.38	<0.38	<0.38	<0.96	**2.9**	<0.23	<0.96	<0.38
		8/25/2015	<1.0 / UJ	<0.30 / UJ	<0.30 / UJ	<1.0 / UJ	<1.0 / UJ	3.1 / J	<1.0 / UJ	<1.0 / UJ	<1.0 / UJ	<1.0 / UJ	**7** / J	<1.0 / UJ	<1.0 / UJ	<1.0 / UJ
		10/21/2015	<1	<0.3	<0.3	<1	0.79 J /	13	<1	<1	<1	<1	**35**	<1	<1	<1
		4/20/2016	< 1.0	< 0.30	< 0.30	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	**9.0**	< 1.0	< 1.0	< 1.0
		10/8/2016	<1.0	<0.30	<0.30	0.57 J /	1.2	18	<1.0	<1.0 / UJ	<1.0 / UJ	<1.0	**42**	<1.0	<1.0	<1.0
		10/8/2016 (DUP)	<1.0	<0.30 / UJ	<0.30	0.48 J / J	1.4	18	<1.0	<1.0 / UJ	<1.0 / UJ	<1.0	**43**	<1.0	<1.0	<1.0
		4/22/2017	<1.0 / UJ	<0.30 / UJ	<0.30 / UJ	<1.0 / UJ	0.3 J / J	9.1 / J	<1.0 / UJ	<1.0 / UJ	<1.0 / UJ	<1.0 / UJ	**23** / J	<1.0 / UJ	<1.0 / UJ	<1.0 / UJ
		10/7/2017	<1	<0.3	<0.3	<1	<1	6.1	<1	<1	<1	<1	**18**	<1	<1	<1
		4/18/2018	<1	<0.3	<0.3	<1	<1	0.47 J / J	<1	<1	<1	<1	1.1 / J	<1	<1	<1
		10/6/2018	<1	<0.3	<0.3	<1	<1	1.4	<1	<1	<1	<1	**3.9**	<1	<1	<1

TABLE B1

Summary of Analytical Results - Explosives
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	**1,3-DNB**		**2,4-DNT**		**2,6-DNT**		**2-A-4,6-DNT**		**4-A-2,6-DNT**		**HMX**		**NB**		**2-NT**		**3-NT**		**4-NT**		**RDX**		**Tetryl**		**1,3,5-TNB**		**2,4,6-TNT**	
		Units	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
		Project Action Limit[1]	10		0.42		0.42		NS		NS		5100		51		5100		NS		NS		2.6		200		5.1		9.5	
		Surface Water RG[2]	4		330		150		NS		NS		260		8000		62		NS		NS		500		NS		15		75	
Site	**Well**	**Date**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**
		Compliance																												
L3	SW777	5/20/2008	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		10/23/2008	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		5/7/2009	<0.19		<0.38		<0.38		<0.38		<0.38		<0.38		<0.19		<0.38		<0.38		<0.38		<0.19		<0.47		<0.19		<0.19	
		10/23/2009	<0.4		<0.78		<0.78		<0.78		<0.78		<0.78		<0.4		<0.78		<0.78		<0.78		<0.4		<0.98		<0.4		<0.4	
		4/9/2010	<0.19		<0.37		<0.37		<0.37		<0.37		<0.37		<0.19		<0.37		<0.37		<0.37		<0.19		<0.46		<0.19		<0.19	
		10/26/2010	<0.55		<1.1		<1.1		<1.1		<1.1		<1.1		<0.55		<1.1		<1.1		<1.1		<0.55		<1.3		<0.55		<0.55	
		4/14/2011	<0.34		<0.66		<0.66		<0.66		<0.66		<0.66		<0.34		<0.66		<0.66		<0.66		<0.34		<0.83		<0.34		<0.34	
		10/14/2011	<0.34		<0.34		<0.34		<0.65		<0.65		<0.65		<0.34		<0.65		<0.65		<0.65		<0.34		<0.82		<0.34		<0.34	
		4/11/2012	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		0.25		<0.39		<0.16		<0.16	
		10/30/2012	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		4/16/2013	<0.4		<0.4		<0.2		<0.2		<0.2		<0.4	U /	<0.4	U /	<0.4	U /	<0.4		<1	U /	<0.2		<0.24		<1		<0.4	
		10/21/2013	<0.38		<0.29		<0.19		<0.19		<0.19		0.55	/ J	<0.38		<0.38		<0.38		<0.96		1.4		<0.23		<0.96		<0.38	
		10/23/2014	<0.4		<0.4		<0.2		<0.2	U / UJ	<0.2		<0.4		<0.4		<0.4		<0.4		<1		<0.2		<0.24	U / UJ	<1		<0.4	
		12/10/2014	<0.38		<0.38		<0.19		<0.19	U / UJ	<0.19		<0.38		<0.38		<0.38		<0.38		<0.96		<0.19		<0.23		<0.96		<0.38	
		8/25/2015	<1.0		<0.30		<0.30		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/21/2015	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		4/20/2016	< 1.0		< 0.30		< 0.30		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0	
		10/8/2016	<1.0		<0.30	/ UJ	<0.30		<1.0	/ UJ	<1.0		<1.0		<1.0		<1.0	/ UJ	<1.0	/ UJ	<1.0		<1.0		<1.0		<1.0		<1.0	
		4/22/2017	<1.0	/ UJ	<0.31	/ UJ	<0.31	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ
		10/7/2017	<1		<0.3		<0.3		<1		<1		0.32	JP / J	<1		<1		<1		<1		<1		<1		<1		<1	
		4/18/2018	<1.4		<0.43		<0.43		<1.4		<1.4		<1.4	/ UJ	<1.4		<1.4		<1.4		<1.4		<1.4		<1.4		<1.4		<1.4	
		10/6/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		In-Plume																												
L14[3]	MW511	10/25/2004	<0.39		<0.39 (0.12)		<0.78 (0.14)		<0.78		<0.78		13		<0.39		<0.78		<0.78		<0.78		**120**		<0.78		<0.39		<0.39	
		7/27/2005	<0.4		<0.4		<0.81		<0.81		<0.81		12		<0.4		<0.81		<0.81		<0.81		**130**		<0.81		<0.4		<0.4	
		10/24/2005	<0.6		<0.6		<1.2		<1.2		<1.2		9.8		<0.6		<1.2		<1.2		<1.2		**80**		<1.2		<0.6		<0.6	
		5/8/2006	<0.42		<0.42		<0.83		<0.83		<0.83		1.6		<0.42		<0.83		<0.83		<0.83		**5.5**		<0.83		<0.42		<0.42	
		10/16/2006	<0.6		<0.6		<1.2		<1.2		<1.2		14		<0.6		<1.2		<1.2		<1.2		**110**		<1.2		<0.6		<0.6	
		5/2/2007	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		10/15/2007	<0.4		<0.4		<0.79		<0.79		<0.79		19		<0.4		<0.79		<0.79		<0.79		**170**		<0.79		<0.4		<0.4	
		5/20/2008	<0.4		<0.4		<0.81		<0.81		<0.81		<0.81		<0.4		<0.81		<0.81		<0.81		0.46		<0.81		<0.4		<0.4	
		10/28/2008	<0.39		<0.39		<0.78		<0.78		<0.78		7.3		<0.39		<0.78		<0.78		<0.78		**58**		<0.78		<0.39		<0.39	
		4/30/2009	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		10/26/2009	<0.18		<0.36		<0.36		<0.36		<0.36		6.4		<0.18		0.29	F /	<0.36		<0.36		**31**		<0.45		<0.18		<0.18	
		4/7/2010	<0.38		<0.73		<0.73		<0.73		<0.73		<0.73		<0.38		<0.73		<0.73		<0.73		<0.38		<0.92		<0.38		<0.38	
		10/26/2010	<0.24		<0.47		<0.47		<0.47		<0.47		13		<0.24		<0.47		<0.47		<0.47		**110**		<0.59		<0.24		<0.24	
		4/18/2011	<0.18		<0.36		<0.36		<0.36		<0.36		0.14	F / J	<0.18		<0.36		<0.36		<0.36		0.94		<0.45		<0.18		<0.18	
		10/14/2011	<0.33		<0.33		<0.33		<0.65		<0.65		10		<0.33		<0.65		<0.65		<0.65		**84**		<0.81		<0.33		<0.33	
		10/26/2012	<0.16		0.41		0.17	F / J	<0.31		<0.31		11		<0.16		0.32		<0.31		0.5		**76**		<0.39		<0.16		<0.16	
		10/21/2013	<0.39		<0.29		<0.19		<0.19		<0.19		6.9		<0.39		<0.39		<0.39		<0.96		**22**		<0.23		<0.96		<0.39	
		12/9/2014	<0.38		<0.38		<0.19		<0.19	U / UJ	<0.19		24		<0.38		<0.38		<0.38		<0.96		**160**		<0.23		<0.96		<0.38	
		10/19/2015	<1		<0.3		<0.3		<1		<1		14		<1		<1		<1		<1		**78**	/ J	<1		<1		<1	
		10/9/2016	<1.0		<0.30	/ UJ	<0.30		<1.0	/ UJ	<1.0		<1.0		<1.0		<1.0	/ UJ	<1.0	/ UJ	<1.0		0.57	J /	<1.0		<1.0		<1.0	
		10/8/2017	<1		<0.3		<0.3		<1		<1		2.1		<1		<1		<1		<1		**8.2**		<1		<1		<1	
		10/1/2018	<1		<0.3		<0.3		<1		<1		8.3		<1		<1		<1		<1		**47**		<1		<1		<1	
	MW512	10/26/2004	<0.51		<0.51 (0.16)		<1 (0.19)		2.1		3.1		85		<0.51		<1		<1		<1		**230**		<1		<0.51		<0.51	
		7/27/2005	<0.47		<0.47		<0.95		2.3		3.4		90		<0.47		<0.95		<0.95		<0.95		**300**		<0.95		<0.47		<0.47	
		10/24/2005	<0.39		<0.39		<0.78		2		2.9		90		<0.39		<0.78		<0.78		<0.78		**190**		<0.78		<0.39		<0.39	
		5/8/2006	<0.75		<0.75		<1.5		<1.5		2.3		76		<0.75		<1.5		<1.5		<1.5		**290**		<1.5		<0.75		<0.75	
		10/16/2006	<0.55		<0.55		<1.1		2.7		3.8		91		<0.55		<1.1		<1.1		<1.1		**290**		<1.1		<0.55		<0.55	
		5/1/2007	<0.39		<0.39		<0.78		<0.78		<0.78		7.8		<0.39		<0.78		<0.78		<0.78		**11**		<0.78		<0.39		<0.39	
		10/15/2007	<0.51		<0.51		<1		1.8		2.6		84		<0.51		<1		<1		<1		**200**		<1		<0.51		<0.51	
		5/21/2008	<0.39		<0.39		<0.78		<0.78		<0.78		4.6		<0.39		<0.78		<0.78		<0.78		**10**		<0.78		<0.39		<0.39	
		5/21/2008 (DUP)	<0.39		<0.39		<0.78		<0.78		<0.78		4.5		<0.39		<0.78		<0.78		<0.78		**11**		<0.78		<0.39		<0.39	
		10/27/2008	<0.39		<0.39		<0.78		2		2.8		68		<0.39		<0.78		<0.78		<0.78		**190**		<0.78		<0.39		<0.39	
		10/27/2008 (DUP)	<0.42		<0.42		<0.83		2.1		3		70		<0.42		<0.83		<0.83		<0.83		**210**		<0.83		<0.42		<0.42	
		4/30/2009	<0.17		<0.33		<0.33		<0.33		<0.33		1.3		<0.17		<0.33		<0.33		<0.33		0.62		<0.42		<0.17		<0.17	
		10/23/2009	<0.28		<0.55		<0.55		0.6		0.83		20		<0.28		<0.55		<0.55		<0.55		**42**		<0.69		<0.28		<0.28	
		4/6/2010	<0.40		<0.78		<0.78		<0.78		<0.78		7.3		<0.40		<0.78		<0.78		<0.78		**11**		<0.98		<0.40		<0.40	
		10/26/2010	<0.31		<0.59		<0.59		1.7		2.4		61		<0.31		<0.59		<0.59		<0.59		**240**		<0.75		<0.31		<0.31	
		4/18/2011	<0.36		<0.70		<0.70		0.76		1.2		42	/ J	<0.36		<0.70		<0.70		<0.70		**150**		<0.88		<0.36		<0.36	
		10/14/2011	<0.28		<0.28		<0.28		0.82		<0.54		74		<0.28		<0.54		<0.54		<0.54		**400**		<0.68		<0.28		<0.28	
		10/26/2012	<0.16		0.39		0.18	F / J	1.5		2.1		58		<0.16		0.33		<0.31		0.5		**220**		<0.39		<0.16		<0.16	
		10/21/2013	<0.38		<0.28		<0.19		0.47		0.59		15		<0.38		0.082	F /	<0.38		<0.94		**28**		<0.23		<0.94		<0.38	
		12/9/2014	<0.38		<0.38		<0.19		0.75	/ J	1.1		36		<0.38		<0.38		<0.38		<0.95		**86**		<0.23		<0.95		<0.38	
		10/19/2015	<1		<0.3		<0.3		<1		1.4		27		<1		<1		<1		<1		**50**		<1		<1		<1	
		10/9/2016	<1.0		<0.30	/ UJ	<0.30		0.71	J / J	1		17		<1.0		<1.0	/ UJ	<1.0	/ UJ	<1.0		**25**		<1.0		<1.0		<1.0	
		10/8/2017	<1		<0.3		<0.3		0.69	J /	0.99	J /	29		<1		<1		<1		<1		**55**		<1		<1		<1	
		10/1/2018	<1		<0.3		<0.3		1.1		1.5		31		<1		<1		<1		<1		**76**		<1		<1		<1	

TABLE B1

Summary of Analytical Results - Explosives
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	**1,3-DNB**	**2,4-DNT**	**2,6-DNT**	**2-A-4,6-DNT**	**4-A-2,6-DNT**	**HMX**	**NB**	**2-NT**	**3-NT**	**4-NT**	**RDX**	**Tetryl**	**1,3,5-TNB**	**2,4,6-TNT**
		Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
		Project Action Limit[1]	10	0.42	0.42	NS	NS	5100	51	5100	NS	NS	2.6	200	5.1	9.5
		Surface Water RG[2]	4	330	150	NS	NS	260	8000	62	NS	NS	500	NS	15	75
Site	**Well**	**Date**	**Result LF/VF**	**Result LF/VF**	**Result LF/VF**	**Result LF/VF**	**Result LF/VF**	**Result LF/VF**	**Result LF/VF**	**Result LF/VF**	**Result LF/VF**	**Result LF/VF**	**Result LF/VF**	**Result LF/VF**	**Result LF/VF**	**Result LF/VF**
		Early Warning														
L14[3]	H7	10/25/2004	<0.39	<0.39 (0.12)	<0.78 (0.14)	<0.78	<0.78	<0.78	<0.39	<0.78	<0.78	<0.78	<0.39	<0.78	<0.39	<0.39
		7/27/2005	<0.39	<0.39	<0.78	<0.78	<0.78	<0.78	<0.39	<0.78	<0.78	<0.78	<0.39	<0.78	<0.39	<0.39
		10/24/2005	<0.62	<0.62	<1.2	<1.2	<1.2	<1.2	<0.62	<1.2	<1.2	<1.2	1.3	<1.2	<0.62	<0.62
		5/8/2006	<0.49	<0.49	<0.98	<0.98	<0.98	<0.98	<0.49	<0.98	<0.98	<0.98	<0.49	<0.98	<0.49	<0.49
		10/16/2006	<0.39	<0.39	<0.78	<0.78	<0.78	<0.78	<0.39	<0.78	<0.78	<0.78	<0.39	<0.78	<0.39	<0.39
		5/2/2007	<0.39	<0.39	<0.78	<0.78	<0.78	<0.78	<0.39	<0.78	<0.78	<0.78	<0.39	<0.78	<0.39	<0.39
		10/15/2007	<0.63	<0.63	<1.3	<1.3	<1.3	<1.3	<0.63	<1.3	<1.3	<1.3	<0.63	<1.3	<0.63	<0.63
		5/21/2008	<0.47	<0.47	<0.94	<0.94	<0.94	<0.94	<0.47	<0.94	<0.94	<0.94	<0.47	<0.94	<0.47	<0.47
		10/27/2008	<0.44	<0.44	<0.87	<0.87	<0.87	<0.87	<0.44	<0.87	<0.87	<0.87	<0.44	<0.87	<0.44	<0.44
		4/30/2009	<0.16	<0.31	<0.31	<0.31	<0.31	<0.31	<0.16	<0.31	<0.31	<0.31	<0.16	<0.39	<0.16	<0.16
		10/23/2009	<0.33	<0.64	<0.64	<0.64	<0.64	<0.64	<0.33	<0.64	<0.64	<0.64	0.4	<0.8	<0.33	<0.33
		4/6/2010	<0.30	<0.59	<0.59	<0.59	<0.59	<0.59	<0.30	<0.59	<0.59	<0.59	<0.30	<0.74	<0.30	<0.30
		10/26/2010	<0.17	<0.34	<0.34	<0.34	<0.34	<0.34	<0.17	<0.34	<0.34	<0.34	<0.17	<0.42	<0.17	<0.17
		4/18/2011	<0.25	<0.48	<0.48	<0.48	<0.48	<0.48 U / UJ	<0.25	<0.48	<0.48	<0.48	<0.25	<0.60	<0.25	<0.25
		10/14/2011	<0.29	<0.29	<0.29	<0.56	<0.56	<0.56	<0.29	<0.56	<0.56	<0.56	0.24 F /	<0.70	<0.29	<0.29
		10/26/2012	<0.16	**1.5**	**0.58**	<0.31	<0.31	<0.31	<0.16	1.4	<0.31	1.5	0.97	<0.39	<0.16	<0.16
		10/21/2013	<0.39	<0.29	<0.19	<0.19	<0.19	<0.39	<0.39	<0.39	<0.39	<0.97	0.44 / J	<0.23	<0.97	<0.39
		12/9/2014	<0.39	<0.39	<0.2	<0.2 U / UJ	<0.2	<0.39	<0.39	<0.39	<0.39	<0.98	<0.2	<0.24	<0.98	<0.39
		10/19/2015	<1 / UJ	<0.3 / UJ	<0.3 / UJ	<1 / UJ	<1 / UJ	<1 / UJ	<1 / UJ	<1 / UJ	<1 / UJ	<1 / UJ	<1 / UJ	<1 / UJ	<1 / UJ	<1 / UJ
		10/9/2016	<1.0	<0.30 / UJ	<0.30	<1.0 / UJ	<1.0	<1.0	<1.0	<1.0 / UJ	<1.0 / UJ	<1.0	<1.0	<1.0	<1.0	<1.0
		10/8/2017	<1	<0.3	<0.3	<1	<1	<1	<1	<1	<1	<1	0.49 J /	<1	<1	<1
		10/1/2018	<1	<0.3	<0.3	<1	<1	<1	<1	<1	<1	<1	0.47 J / J	<1	<1	<1
M6		***In-Plume***														
	MW212R	10/21/2004	<3.9	**2,800**	**860**	66 / J	67	<7.8	14 / J	**12,000**	970	6,500	<3.9	<7.8	<3.9	**210**
		7/13/2005	<3.9	**490**	**200**	32	23	<7.8	<3.9	3,500	290	1,900	<3.9	<7.8	<3.9	**26** B /
		10/18/2005	<39	**17,000**	**3,500**	340	320	<78	<39	**81,000**	4,000	47,000	<39	<78	<39	**1,000**
		5/1/2006	<4.1	**2,800**	**630**	34	28	<8.2	<4.1	**7,500**	590	5,800	<4.1	<8.2	<4.1	**260**
		10/6/2006	<40	**6,300**	**1,800**	190	140	<81	<40	**31,000**	2,600	19,000	<40	<81	<40	**880**
		4/24/2007	<3.9	**650**	**250**	45	37	<7.8	<3.9	3,300	370	2,300	<3.9	<7.8	<3.9	**25**
		10/10/2007	<39	**3,800**	**1,300**	190	200	<78	<39	**19,000**	1,700	12,000	<39	<78	<39	**440**
		5/9/2008	<4.8	**5,700**	**1,000**	70	72	<9.6	<4.8	**21,000**	1,300	15,000	<4.8	<9.6	<4.8	**460**
		5/9/2008 (DUP)	<3.9	4,400	970	68	70	<7.8	4.3	17,000	1,200	12,000	<3.9	<7.8	<3.9	450
		10/16/2008	<0.42	<0.42	<0.83	<0.83	<0.83	<0.83	<0.42	<0.83	<0.83	<0.83	<0.42	<0.83	<0.42	<0.42
		5/7/2009	<16	**1,000**	**340**	<31	<31	<31 U / UJ	<16	1,800	370	1,300	<16	<39	<16	**150**
		10/26/2009	<22	**4,500**	**1,200**	<43	<43	<43	<22	**20,000**	1,600	11,000	<22	<55	<22	**870**
		4/9/2010	<0.24	**95**	**84**	15	13	<0.46	<0.24	5	39	<0.46	<0.24	<0.58	<0.24	8
		11/2/2010	<2.0	**140**	**280**	19	14	<3.8	<2.0	2,900	260	1,700	<2.0	<4.8 U / UJ	<2.0	**67**
		4/21/2011	<28	**2,400**	**730**	70	73	<54	<28	4,800 / J	710 / J	2,100 / J	<28	<68	<28	**230** / J
		4/21/2011 (DUP)	<25	**2,900**	**870**	64	74	<49	<25	**8,100** / J	920 / J	4,200 / J	<25	<61	<25	**350** / J
		10/19/2011	<35	**2,700**	**1,100**	100	57 F / NJ	<68	<35	**12,000**	<68	7,500	<35	<86	<35	**230**
		10/19/2011 (DUP)	<30	**2,700**	**1,000**	120	54 F / J	<59	<30	**12,000**	<59	7,700	<30	<74	<30	**210**
		4/15/2012	1.1 F /	**620**	**260**	64 / J	51 / J	<3.1	1.9	4,100	<3.1	2,100	<1.6	<3.9	<1.6	**39**
		10/23/2012	<16	**2,500**	**640**	270 / J	160 / J	<31	<16	**12,000**	<31	6,700	<16	<39	<16	**200**
		10/23/2012 (DUP)	<16	**3,200**	**920**	290 / J	170 / J	<31	<16	**15,000**	<31	7,900	<16	<39	<16	**340**
		4/11/2013	10 / J	**1,500** / J	**440** / J	37 F / JJ	56 / J	<0.38 U / UJ	3.4 / J	<0.38 U / UJ	370 / J	2,400 / J	0.18 F / J	<0.23 U / UJ	1.6 / J	**140** / J
		4/11/2013 (DUP)	1.9 / J	**1,400** / J	**430** / J	30 F / JJ	49 / J	<0.37 U / UJ	2.4 / J	500 / J	370 / J	2,400 / J	0.17 F / J	<0.22 U / UJ	2.3 / J	**150**
		10/17/2013	10 / J	**7,600**	**2,200**	140 / J	160	<4.2	14	**28,000**	2,100	18,000	2.4 / J	<2.5	**37** / J	**1,300** F /
		10/22/2014	1.5 / J	**620** / J	**300** / J	37 / J	24 / J	<0.39	1.6 / J	1,800 / J	490 / J	1,700 / J	<0.2	<0.24 U / UJ	<0.98	**60** / J
		10/22/2014 (DUP)	1.7 / J	**590** / J	**300** / J	24 / J	19 / J	<0.4	3.3 / J	1,700 / J	390 / J	1,600 / J	<0.2	<0.24 U / UJ	<1	**85** / J
		12/18/2014	<810	**5,800**	**1,500**	<410	<410	<810	<810	**22,000**	1,900	12,000	<410	<2.4	**8.4** F /	**940**
		12/18/2014 (DUP)	<800	**3,800**	**930**	<400	<400	<800	<800	**14,000**	1,400	8,600	<400	<480	3.2 F /	**460**
		8/17/2015	<20	**890**	**310**	43	<20	<20	<20	4,200	490	2,700	<20	<20	<20	**51**
		8/17/2015 (DUP)	<25	**820**	**340**	38	<25	<25	<25	4,100	490	2,600	<25	<25	<25	**60**
		10/27/2015	<20	**2,100**	**690** / J	39 / J	<20	<20	<20	**7,400**	920	5,500	<20	<20	<20	**280** / J
		10/27/2015 (DUP)	<20	**1,700**	**470** / J	54 / J	<20	<20	<20	**6,100**	780	4,600	<20	<20	<20	**160** / J
		4/26/2016	< 1.0	**58**	**85**	12	11	< 1.0 /UJ	< 1.0	1.3 /J	39	< 1.0	< 1.0	0.50 J/	< 1.0	**12**
		10/4/2016	<20	**1,700**	**460**	41	<20	<20	<20	**7,000**	730	4,500	<20	<20	<20	**210**
		4/20/2017	<1.0	**120**	**47**	5.7	<1.0	<1.0	<1.0	300	57	120	<1.0	<1.0	<1.0	**10**
		10/6/2017	6 J / J	**1,100**	**200**	46	<20	26	<20	**5,200**	500	3000	<20	10 J /	<20	**15** J /
		10/6/2017 (DUP)	<20	**970**	**200**	36	<20	24 / J	<20	4,600	440	2700	<20	10 J /	<20	**21**
		4/15/2018	<1	**11**	**5.9**	2.5	1.5	<1 / UJ	<1	54	7.9	11	<1	<1	<1	1.8
		4/15/2018 (DUP)	<1	**11**	**5.8**	2.5	1.5	<1 / UJ	<1	55	7.8	11	<1	<1	<1	1.8
		10/8/2018	<50	**920** / J	**250** / J	16 J / J	<50	<50	<50	4000	360 / J	2500 / J	<50	<50	<50	**130**
		10/8/2018 (DUP)	<50	**1200** / J	**330** / J	22 J /	<50	<50	<50	5100	500 / J	3400 / J	<50	<50	<50	**180**

TABLE B1

Summary of Analytical Results - Explosives
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	1,3-DNB		2,4-DNT		2,6-DNT		2-A-4,6-DNT		4-A-2,6-DNT		HMX		NB		2-NT		3-NT		4-NT		RDX		Tetryl		1,3,5-TNB		2,4,6-TNT	
		Units	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
		Project Action Limit[1]	10		0.42		0.42		NS		NS		5100		51		5100		NS		NS		2.6		200		5.1		9.5	
		Surface Water RG[2]	4		330		150		NS		NS		260		8000		62		NS		NS		500		NS		15		75	
Site	Well	Date	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF
		In-Plume																												
M6	MW652	10/21/2004	**13**		**10,000**		**4,900**		300	/ J	190		<7.8		39		**47,000**		3,700		31,000		<3.9		<7.8		<3.9		**2,300**	
		10/21/2004 (DUP)	**13**		**14,000**		**4,900**	/ J	290	/ J	180		<10		38		**66,000**		3,800		43,000		<5.1		<10		<5.1		**2,400**	
		7/13/2005	<58		**10,000**		**3,500**		280		<120		<120		<58		**56,000**		3,900		37,000		<58		<120		<58		**2,200**	B /
		10/18/2005	9.3		**21,000**		**5,400**		270		130		<7.8		25		**98,000**		5,700		65,000		<3.9		<7.8		<3.9		**3,400**	
		5/1/2006	<39		**2,900**		**970**		<78		<78		<78		<39		**11,000**		1,000		8,100		<39		<78		<39		**560**	
		10/6/2006	<42		**5,100**		**1,800**		140		91		<85		<42		**23,000**		1,900		15,000		<42		<85		<42		**1,300**	
		4/24/2007	<3.9		**2,200**		**670**		60		35		<7.8		<3.9		**9,000**		820		6,700		<3.9		<7.8		<3.9		**450**	
		10/10/2007	<39		**4,600**		**1,700**		160		120		<78		<39		**20,000**		1,700		13,000		<39		<78		<39		**1,100**	
		5/7/2008	4.8		**3,800**		**1,300**		80		90		<7.8		9.7		**17,000**		1,400		12,000		<3.9		<7.8		<3.9		**710**	
		5/7/2008 (DUP)	5.1		4,100		1,300		85		96		<7.8		10		18,000		1,600		13,000		<3.9		<7.8		<3.9		710	
		10/16/2008	<3.9		**4,200**		**2,700**		120		99		<7.8		<3.9		**17,000**		1,500		12,000		<3.9		<7.8		<3.9		**910**	
		10/16/2008 (DUP)	<3.9		**4,400**		**2,100**		130		100		<7.8		<3.9		**18,000**		1,500		12,000		<3.9		<7.8		<3.9		**850**	
		5/7/2009	<16		**2,000**		**630**		<31		<31		<31	U / UJ	<16		**5,300**		680		5,500		<16		<39		<16		**340**	
		10/26/2009	<21		**4,900**		**1,500**		120		120		<41		<21		**23,000**		1,700		14,000		<21		<51		<21		**810**	
		4/9/2010	<29		**8,000**		**2,800**		<57		<57		<57		<29		**36,000**		2,800		25,000		<29		<72		<29		**1,400**	
		11/2/2010	<2.1		**5,800**		**2,800**		180		120		<4.1		<2.1		**28,000**		2,000		18,000		<2.1		<5.2	U / UJ	<2.1		**1,200**	
		4/21/2011	<23		**5,400**		**1,400**		75		73		<44		<23		**24,000**		1,700	/ J	17,000		<23		<56		<23		**770**	
		4/21/2011 (DUP)	<18		**5,900**		**1,500**		79		79		<36		<18		**27,000**		2,300	/ J	20,000		<18		<45		<18		**870**	
		10/19/2011	<20		**2,800**		**1,500**		86		60	/ J	<39		<20		**13,000**		<39		8,100		<20		<49		<20		**520**	
		10/19/2011 (DUP)	<32		**3,000**		**1,700**		96		69	/ J	<63		<32		**14,000**		<63		9,000		<32		<79		<32		**590**	
		4/14/2012	9.5	F /	**8,400**		**3,300**		360		380	/ J	<31		<16		**44,000**		<31		28,000		<16		<39		<16		**1,600**	
		4/14/2012 (DUP)	7.9	F /	**6,800**		**2,700**		320		320	/ J	<31		<16		**35,000**		<31		22,000	/ J	<16		<39		<16		**1,300**	
		10/23/2012	<16		**5,100**		**2,000**		280	/ J	230	/ J	<31		<16		**23,000**		<31		14,000		<16		<39		<16		**950**	
		4/10/2013	1.8	/ JJ	**1,700**	/ J	**480**	/ J	33	/ J	71	/ JJ	<0.41	U / UJ	4.3	/ JJ	**7,800**	/ J	760	/ J	5,100	/ J	0.48	/ JJ	<0.24	U / UJ	3	/ J	**270**	F / J
		10/17/2013	2.2	/ J	**1,100**		**360**		35	F / J	80		<0.4		3.5	/ J	4,600		390		2,900		<0.2		<0.24		3.2	/ J	**200**	
		10/22/2014	**14**	/ J	**5,100**	/ J	**3,000**	/ J	150	/ J	170	/ J	<4		27	/ J	**17,000**	/ J	2,700	/ J	16,000	/ J	<2		<2.4	U / UJ	<10		**1,200**	/ J
		12/18/2014	7.8		**4,700**		**1,800**		97		130		<810		17		**19,000**		2,100		15,000		<2		<2.4		<10		**610**	
		8/18/2015	<20		**980**		**320**		38		<20		<20		<20		4,400		360		2,500		<20		<20		<20		**120**	
		10/27/2015	<20		**1,300**		**430**		47		<20		<20		<20		4,700		440		3,000		<20		<20		<20		**160**	
		10/27/2015 (DUP)	<20		**1,100**		**400**		50		<20		<20		<20		4,500		410		2,800		<20		<20		<20		**150**	
		4/26/2016	< 20		**2300**		**850**		94		88	/J	< 20	/UJ	< 20		**7700**		920		5500		< 20		< 20		< 20		**290**	
		4/26/2016 (DUP)	< 20		**2100**		**780**		84		80	/J	< 20	/UJ	< 20		**7000**		800		4900		< 20		< 20		< 20		**270**	
		10/4/2016	<20		**1,900**		**570**		79		<20		<20		<20		**6,600**		630		4,600		<20		<20		<20		**340**	
		10/4/2016 (DUP)	<20		**1,600**		**520**		67		<20		<20		<20		**5,600**		580		4,100		<20		<20		<20		**280**	
		4/20/2017	<20		**2,100**		**800**		100		<20		<20		<20		**9,700**		1,100		6,700		<20		<20		<20		**310**	
		4/20/2017 (DUP)	<20		**1,900**		**720**		88		<20		<20		<20		**8,700**		950		6,000		<20		<20		<20		**280**	
		10/5/2017	<20		**2,000**		**640**		92		<20		22	/ J	<20		**7,400**		800		5300		<20		8.2	J /	<20		**320**	
		4/17/2018	<20		**1300**		**320**		40		<20		<20	/ UJ	<20		**5600**		510		2700		<20		<20		<20		**170**	
		10/4/2018	<50		**1100**		**350**		42	J /	<50		<50		<50		4700		440		2800		<50		<50		<50		**150**	
		Early Warning																												
	MW123R	10/20/2004	<0.65		<0.65 (0.2)		<1.3 (0.24)		<1.3		<1.3		<1.3		<0.65		<1.3		<1.3		<1.3		<0.65		<1.3		<0.65		<0.65	
		7/18/2005	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		10/17/2005	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		5/1/2006	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		10/10/2006	<0.57		<0.57		<1.1		<1.1		<1.1		<1.1		<0.57		<1.1		<1.1		<1.1		<0.57		<1.1		<0.57		<0.57	
		4/25/2007	<0.54		<0.54		<1.1		<1.1		<1.1		<1.1		<0.54		<1.1		<1.1		<1.1		<0.54		<1.1		<0.54		<0.54	
		10/11/2007	<0.46		<0.46		<0.91		<0.91		<0.91		<0.91		<0.46		<0.91		<0.91		<0.91		<0.46		<0.91		<0.46		<0.46	
		5/8/2008	<0.53		<0.53		<1.1		<1.1		<1.1		<1.1		<0.53		<1.1		<1.1		<1.1		<0.53		<1.1		<0.53		<0.53	
		10/20/2008	<0.45		<0.45		<0.9		<0.9		<0.9		<0.9		<0.45		<0.9		<0.9		<0.9		<0.45		<0.9		<0.45		<0.45	
		10/20/2008 (DUP)	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		5/6/2009	<0.2		<0.39		<0.39		<0.39		<0.39		<0.39		<0.2		<0.39		<0.39		<0.39		<0.2		<0.49		<0.2		<0.2	
		10/26/2009	<0.2		<0.39		<0.39		<0.39		<0.39		<0.39		<0.2		<0.39		<0.39		<0.39		<0.2		<0.49		<0.2		<0.2	
		4/8/2010	<0.24		<0.47		<0.47		<0.47		<0.47		<0.47		<0.24		<0.47		<0.47		<0.47		<0.24		<0.59		<0.24		<0.24	
		11/1/2010	<0.19		<0.37		<0.37		<0.37		<0.37		<0.37		<0.19		1		<0.37		0.46		<0.19		<0.46		<0.19		<0.19	
		4/20/2011	<0.26		<0.51		<0.51		<0.51		<0.51		<0.51		<0.26		<0.51		<0.51		<0.51		<0.26		<0.64		<0.26		<0.26	
		10/18/2011	<0.34		<0.34		<0.34		<0.65		<0.65		<0.65		<0.34		<0.65		<0.65		<0.65		<0.34		<0.82		<0.34		<0.34	
		4/14/2012	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		4/14/2012 (DUP)	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		10/23/2012	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		4/10/2013	<0.4		<0.4		<0.2		<0.2		<0.2		<0.4		<0.4		<0.4		<0.4		<1		<0.2		<0.24		<1		<0.4	
		10/17/2013	<0.42	U / UJ	<0.32	U / UJ	<0.21	U / UJ	<0.21	U / UJ	<0.21	U / UJ	<0.42	U / UJ	<0.42	U / UJ	<0.42	U / UJ	<0.42	U / UJ	<1.1	U / UJ	<0.21	U / UJ	<0.25	U / UJ	<1.1	U / UJ	<0.42	U / UJ
		10/21/2014	<0.4		<0.4		<0.2		<0.2	U / UJ	<0.2		<0.4		<0.4		<0.4		<0.4		<1		<0.2		<0.24	U / UJ	<1		<0.4	
		12/17/2014	<0.4		<0.4		<0.2		<0.2		<0.2		<0.4		<0.4		<0.4		<0.4		<1		<0.2		<0.24		<1		<0.4	
		8/18/2015	<1.0		<0.30		<0.30		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/27/2015	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		4/21/2016	< 1.0		< 0.30		< 0.30		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0	
		10/4/2016	<1.0	/ UJ	<0.30	/ UJ	<0.30	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ
		4/20/2017	<1.0		<0.30		<0.30		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/5/2017	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		4/15/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		10/4/2018	<1		<0.3		**0.47**	P / J	<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	

TABLE B1

Summary of Analytical Results - Explosives
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	1,3-DNB		2,4-DNT		2,6-DNT		2-A-4,6-DNT		4-A-2,6-DNT		HMX		NB		2-NT		3-NT		4-NT		RDX		Tetryl		1,3,5-TNB		2,4,6-TNT	
		Units	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
		Project Action Limit[1]	10		0.42		0.42		NS		NS		5100		51		5100		NS		NS		2.6		200		5.1		9.5	
		Surface Water RG[2]	4		330		150		NS		NS		260		8000		62		NS		NS		500		NS		15		75	
Site	Well	Date	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF
		Early Warning																												
	MW162R	10/20/2004	<0.39		<0.39 (0.12)		<0.78 (0.14)		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		7/13/2005	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		10/20/2005	<0.63		<0.63		<1.3		<1.3		<1.3		<1.3		<0.63		<1.3		<1.3		<1.3		<0.63		<1.3		<0.63		<0.63	
		5/3/2006	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		10/11/2006	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		4/25/2007	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		10/9/2007	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		5/1/2008	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		10/20/2008	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		5/6/2009	<0.22		<0.42		<0.42		<0.42		<0.42		<0.42		<0.22		<0.42		<0.42		<0.42		<0.22		<0.53		<0.22		<0.22	
		10/26/2009	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		4/8/2010	<0.29		<0.57		<0.57		<0.57		<0.57		<0.57		<0.29		<0.57		<0.57		<0.57		<0.29		<0.72		<0.29		<0.29	
		11/1/2010	<0.27		<0.52		<0.52		<0.52		<0.52		<0.52		<0.27		<0.52		<0.52		<0.52		<0.27		<0.65		<0.27		<0.27	
		4/20/2011	<0.21		<0.41		<0.41		<0.41		<0.41		<0.41		<0.21		<0.41		<0.41		<0.41		<0.21		<0.51		<0.21		<0.21	
		10/18/2011	<0.41		<0.41		<0.41		<0.79		<0.79		<0.79		<0.41		<0.79		<0.79		<0.79		<0.41		<0.99		<0.41		<0.41	
		10/18/2011 (DUP)	<0.33		<0.33		<0.33		<0.64		<0.64		<0.64		<0.33		<0.64		<0.64		<0.64		<0.33		<0.81		<0.33		<0.33	
		4/14/2012	<0.16		0.27	F / J	0.14	F /	<0.31		<0.31		<0.31		<0.16		0.7		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		10/23/2012	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		4/10/2013	<0.41		<0.41		<0.2		<0.2		<0.2		<0.41		<0.41		<0.41		<0.41		<1		<0.2		<0.24		<1		<0.41	U / UJ
		10/17/2013	<0.41		<0.31		<0.21		<0.21		<0.21		<0.41		<0.41		<0.41		<0.41		<1		<0.21		<0.25		<1		<0.41	
		10/21/2014	<0.4		<0.4		<0.2		<0.2	U / UJ	<0.2		<0.4		<0.4		<0.4		<0.4		<1		<0.2		<0.24	U / UJ	<1		<0.4	
		12/17/2014	<0.41		<0.39		<0.2		<0.21		<0.2		<0.39		<0.39		<0.39		<0.41		<0.98		<0.2		<0.25		<1		<0.41	
		8/18/2015	<1.0		<0.30		<0.30		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		1.3		<1.0		<1.0		<1.0	
		10/27/2015	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		4/21/2016	< 1.0		< 0.30		< 0.30		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0	
		10/4/2016	<1.0	/ UJ	<0.30	/ UJ	<0.30	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ
		4/20/2017	<1.0		<0.30		<0.30		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/5/2017	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		4/15/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		10/4/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
M6	MW313	10/22/2004	<0.39		<0.39 (0.12)		<0.78 (0.14)		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		7/19/2005	<0.63		<0.63		<1.3		<1.3		<1.3		<1.3		<0.63		<1.3		<1.3		<1.3		<0.63		<1.3		<0.63		<0.63	
		10/19/2005	<0.45		<0.45		<0.9		<0.9		<0.9		<0.9		<0.45		<0.9		<0.9		<0.9		<0.45		<0.9		<0.45		<0.45	
		5/2/2006	<0.58		<0.58		<1.2		<1.2		<1.2		<1.2		<0.58		<1.2		<1.2		<1.2		<0.58		<1.2		<0.58		<0.58	
		10/11/2006	<0.6		<0.6		<1.2		<1.2		<1.2		<1.2		<0.6		<1.2		<1.2		<1.2		<0.6		<1.2		<0.6		<0.6	
		4/30/2007	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		10/10/2007	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		5/7/2008	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		10/16/2008	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		5/7/2009	<0.19		<0.37		<0.37		<0.37		<0.37		<0.37	U / UJ	<0.19		<0.37		<0.37		<0.37		<0.19		<0.46		<0.19		<0.19	
		5/7/2009 (DUP)	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31	U / UJ	<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		10/26/2009	<0.2		<0.39		<0.39		<0.39		<0.39		<0.39		<0.2		0.63		<0.39		0.27	F /	<0.2		<0.49		<0.2		<0.2	
		10/26/2009 (DUP)	<0.19		<0.36		<0.36		<0.36		<0.36		<0.36		<0.19		<0.36		<0.36		<0.36		<0.19		<0.46		<0.19		<0.19	
		4/9/2010	<0.29		<0.56		<0.56		<0.56		<0.56		<0.56		<0.29		<0.56		<0.56		<0.56		<0.29		<0.71		<0.29		<0.29	
		11/2/2010	<0.20		<0.38		<0.38		<0.38		<0.38		<0.38		<0.20		<0.38		<0.38		<0.38		<0.20		<0.48		<0.20		<0.20	
		11/2/2010 (DUP)	<0.38		<0.73		<0.73		<0.73		<0.73		<0.73		<0.38		<0.73		<0.73		<0.73		<0.38		<0.92		<0.38		<0.38	
		4/21/2011	<0.20		<0.38		<0.38		<0.38		<0.38		<0.38		<0.20		<0.38		<0.38		<0.38		<0.20		<0.48	U / UJ	<0.20		<0.20	
		10/19/2011	<0.36		<0.36		<0.36		<0.70		<0.70		<0.70		<0.36		<0.70		<0.70		<0.70		<0.36		<0.88		<0.36		<0.36	
		4/15/2012	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		10/23/2012	<1.6		**5**		**3.3**	/ J	<3.1		<3.1		<3.1		<1.6		**44**		<3.1		28		<1.6		<3.9		<1.6		<1.6	
		4/11/2013	<0.36		<0.36		<0.18		<0.18		<0.18		<0.36		<0.36		<0.36		<0.36		<0.91		0.061	F / J	<0.22		<0.91		<0.36	
		10/17/2013	<0.42		<0.31		<0.21		<0.21		<0.21		<0.42		<0.42		<0.42		<0.42		<1		<0.21		<0.25		<1		<0.42	
		10/22/2014	<0.39		<0.39		<0.2		<0.2		<0.2		<0.39		<0.39		0.88		<0.39		0.53	F /	<0.2		<0.24	U / UJ	<0.98		<0.39	
		12/18/2014	<0.4		<0.4		<0.2		<0.2		<0.2		<0.4		<0.4		0.44		<0.4		0.2	F /	<0.2		<0.24		<0.97		<0.39	
		8/18/2015	<1.0		<0.30		<0.30		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/27/2015	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		4/26/2016	< 1.0		< 0.30		< 0.30		< 1.0		< 1.0		0.33	J/J	< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0	
		10/4/2016	<1.0		<0.30		<0.30		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		4/20/2017	<1.0		<0.30		<0.30		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		0.84	J /	<1.0		<1.0		<1.0	
		10/5/2017	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		4/17/2018	<1		<0.3		<0.3		<1		<1		<1	/ UJ	<1		<1		<1		<1		<1		<1		<1		<1	
		10/4/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	

TABLE B1

Summary of Analytical Results - Explosives
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	**1,3-DNB**		**2,4-DNT**		**2,6-DNT**		**2-A-4,6-DNT**		**4-A-2,6-DNT**		**HMX**		**NB**		**2-NT**		**3-NT**		**4-NT**		**RDX**		**Tetryl**		**1,3,5-TNB**		**2,4,6-TNT**	
		Units	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
		Project Action Limit[1]	10		0.42		0.42		NS		NS		5100		51		5100		NS		NS		2.6		200		5.1		9.5	
		Surface Water RG[2]	4		330		150		NS		NS		260		8000		62		NS		NS		500		NS		15		75	
Site	**Well**	**Date**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**
		Early Warning																												
M6	MW318	10/21/2004	<2		<2 (0.61)		**6.7**	/ J	<3.9		<3.9		<3.9		<2		<3.9		<3.9		<3.9		<2		<3.9		<2		<2	
		7/13/2005	<0.55		<0.55		<1.1		<1.1		<1.1		<1.1		<0.55		<1.1		<1.1		<1.1		<0.55		<1.1		<0.55		<0.55	
		7/13/2005 (DUP)	<0.55		<0.55		<1.1		<1.1		<1.1		<1.1		<0.55		<1.1		<1.1		<1.1		<0.55		<1.1		<0.55		<0.55	
		10/18/2005	<0.44		<0.44		<0.88		<0.88		<0.88		<0.88		<0.44		<0.88		<0.88		<0.88		<0.44		<0.88		<0.44		<0.44	
		10/18/2005 (DUP)	<0.44		<0.44		<0.87		<0.87		<0.87		<0.87		<0.44		<0.87		<0.87		<0.87		<0.44		<0.87		<0.44		<0.44	
		5/2/2006	<0.78		<0.78		<1.6		<1.6		<1.6		3.4		<0.78		<1.6		<1.6		<1.6		<0.78		<1.6		<0.78		<0.78	
		5/2/2006 (DUP)	<0.78		<0.78		<1.6		<1.6		<1.6		4.1		<0.78		<1.6		<1.6		<1.6		<0.78		<1.6		<0.78		<0.78	
		10/10/2006	<0.47		<0.47		<0.95		<0.95		<0.95		<0.95		<0.47		<0.95		4.4		<0.95		<0.47		<0.95		<0.47		<0.47	
		10/10/2006 (DUP)	<0.4		<0.4		<0.79		<0.79		<0.79		<0.79		<0.4		<0.79		2.8		<0.79		<0.4		<0.79		<0.4		<0.4	
		4/23/2007	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		10/9/2007	<0.51		<0.51		<1		<1		<1		<1		<0.51		<1		<1		<1		<0.51		<1		<0.51		<0.51	
		5/7/2008	<0.94		<0.94		<1.9		<1.9		<1.9		<1.9		<0.94		<1.9		<1.9		<1.9		<0.94		<1.9		<0.94		<0.94	
		10/14/2008	<0.78		<0.78		<1.6		<1.6		<1.6		<1.6		<0.78		<1.6		<1.6		<1.6		**4.4**		<1.6		<0.78		<0.78	
		5/6/2009	<0.16	U / UJ	<0.31	U / UJ	<0.31	U / UJ	<0.31	U / UJ	<0.31	U / UJ	<0.31	U / UJ	<0.16	U / UJ	<0.31	U / UJ	<0.31	U / UJ	<0.31	U / UJ	<0.16	U / UJ	<0.39	U / UJ	<0.16	U / UJ	<0.16	U / UJ
		10/26/2009	<0.83		<1.6		<1.6		<1.6		<1.6		<1.6		<0.83		<1.6		<1.6		<1.6		<0.83		<2		<0.83		<0.83	
		4/8/2010	<0.21		<0.41		<0.41		<0.41		<0.41		<0.41		<0.21		<0.41		<0.41		<0.41		<0.21		<0.52		<0.21		<0.21	
		11/2/2010	<0.36		<0.70		<0.70		<0.70		<0.70		<0.70		<0.36		<0.70		<0.70		<0.70		<0.36		<0.88		<0.36		<0.36	
		4/21/2011	<0.29		<0.56		<0.56		<0.56		<0.56		<0.56		<0.29		0.85		<0.56		<0.56		<0.29		<0.71		<0.29		<0.29	
		10/19/2011	<0.95		<0.95		**2.8**	/ NJ	<1.8		<1.8		<1.8		<0.95		<1.8		<1.8		<1.8		<0.95		<2.3		<0.95		2.9	/ J
		4/14/2012	<0.32		0.21	F / J	**0.45**	F / J	<0.62		<0.62		<0.62		<0.32		<0.62		<0.62		<0.62		<0.32		<0.78		<0.32		<0.32	
		10/23/2012	<0.8		<1.6		<1.6		<1.6		<1.6		<1.6		<0.8		<1.6		<1.6		<1.6		<0.8		<2		<0.8		<0.8	
		4/10/2013	<0.37	U / UJ	<0.37	U / UJ	**0.79**	/ J	<0.19	U / UJ	<0.19	U / UJ	16	/ JJ	<0.37	U / UJ	<0.37	U / UJ	<0.37	U / UJ	<0.94	U / UJ	<0.19	U / UJ	<0.22	U / UJ	2.4	/ JJ	<0.37	U / UJ
		10/17/2013	5.8	/ J	<0.31	U / UJ	**0.54**	/ J	1.4	/ J	<0.21	U / UJ	<0.42	U / UJ	<0.42	U / J	<0.42	U / UJ	<0.42	U / UJ	<1	U / UJ	<0.21	U / UJ	<0.25	U / UJ	<1	U / UJ	<0.42	U / UJ
		10/21/2014	1.8	/ J	<0.4		<0.2		<0.2	U / UJ	<0.2		<0.4		<0.4		<0.4		<0.4		<1		0.64	/ J	<0.24	U / UJ	<1		<0.4	
		12/17/2014	1.6		0.2	F /	<0.2		1.2		<0.2		<0.4		<0.4		<0.4		<0.4		<1		<0.2		<0.24		<1		<0.4	
		8/18/2015	<1.0		<0.30		<0.30		<1.0		<1.0		<1.0		0.68	J	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		0.27	J
		10/27/2015	<1		<0.3		<0.3	/ UJ	<1		<1		<1		2.1	/ J	0.48	/ J	<1		2	/ J	<1		<1		<1		<1	
		4/26/2016	< 1.0		< 0.30		< 0.30		< 1.0		< 1.0		< 1.0	/UJ	4.7	/J	< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0	
		10/4/2016	<1.0		<0.30		<0.30		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		2	/ J	<1.0		<1.0		<1.0		<1.0	
		4/21/2017	<1.0		<0.30		<0.30		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		1.5	/ J	<1.0	
		10/5/2017	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		4/17/2018	<1		<0.3		<0.3		<1		<1		<1	/ UJ	3.3	/ J	<1		0.51	J / J	<1		<1		<1		<1		<1	
		10/4/2018	<1		<0.3		<0.3		<1		<1		<1		<1		0.41	J / J	<1		<1		<1		<1		<1		<1	
	MW319	10/21/2004	<2.7		<2.7 (0.83)		<5.3 (0.98)		<5.3		<5.3		<5.3		<2.7		<5.3		<5.3		<5.3		<2.7		<5.3		<2.7		<2.7	
		7/13/2005	<0.49		<0.49		<0.99		<0.99		<0.99		<0.99		<0.49		<0.99		<0.99		<0.99		<0.49		<0.99		<0.49		<0.49	
		10/18/2005	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		5/2/2006	<0.78		<0.78		<1.6		<1.6		<1.6		8.9		<0.78		<1.6		<1.6		<1.6		<0.78		<1.6		<0.78		<0.78	
		10/10/2006	<0.43		<0.43		**11**		<0.86		<0.86		<0.86		<0.43		<0.86		6.7		<0.86		<0.43		<0.86		<0.43		<0.43	
		4/23/2007	<0.41		<0.41		**2**		<0.82		<0.82		<0.82		<0.41		<0.82		<0.82		<0.82		<0.41		<0.82		<0.41		<0.41	
		10/9/2007	<0.67		<0.67		<1.3		<1.3		<1.3		<1.3		<0.67		<1.3		<1.3		<1.3		<0.67		<1.3		<0.67		<0.67	
		5/7/2008	<2		<2		<4		<4		<4		<4		<2		<4		<4		<4		<2		<4		<2		<2	
		10/14/2008	<0.83		<0.83		<1.7		<1.7		<1.7		<1.7		<0.83		<1.7		<1.7		<1.7		**12**		<1.7		<0.83		<0.83	
		5/6/2009	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		10/26/2009	<0.8		<1.6		<1.6		<1.6		<1.6		<1.6		<0.8		<1.6		<1.6		<1.6		<0.8		<2		<0.8		<0.8	
		4/8/2010	<0.25		<0.49		**3**		<0.49		<0.49		<0.49		<0.25		<0.49		<0.49		<0.49		<0.25		<0.62		<0.25		<0.25	
		11/2/2010	<0.19		**6.2**	/ J	<0.36		<0.36		<0.36		<0.36		<0.19		0.85	/ J	<0.36		<0.36		<0.19		<0.46		<0.19		<0.19	
		4/21/2011	<0.18		**0.74**		<0.35		<0.35		<0.35		<0.35		<0.18		<0.35		<0.35		<0.35		<0.18		<0.44		<0.18		<0.18	
		10/19/2011	<0.87		<0.87		<0.87		<1.7		<1.7		<1.7		<0.87		<1.7		<1.7		<1.7		<0.87		<2.1		<0.87		5.8	/ J
		4/14/2012	<0.32		<0.62		<0.62		<0.62		<0.62		<0.62		<0.32		<0.62		<0.62		<0.62		<0.32		<0.78		<0.32		0.29	F / J
		10/23/2012	<0.8		<1.6		<1.6		<1.6		<1.6		<1.6		<0.8		<1.6		<1.6		<1.6		<0.8		<2		<0.8		<0.8	
		4/10/2013	<0.4		<0.4		<0.2		6.2		<0.2		57	/ JJ	<0.4		<0.4		<0.4		<1		<0.2		<0.24		<1		<0.4	
		10/17/2013	<0.42		<0.32		**2.8**	/ J	<0.21		<0.21		<0.42		1.5	/ J	<0.42		<0.42		<1.1		<0.21		<0.25		<1.1		<0.42	
		10/21/2014	<0.4	U / UJ	<0.4		<0.2		0.74	/ J	<0.2		<0.4		0.64	/ J	<0.4		<0.4		<1		<0.2		<0.24	U / UJ	<1	U / UJ	<0.4	
		12/17/2014	<0.39		<0.39		<0.2		<0.21		<0.21		<0.39		<0.39		<0.39		<0.39		<0.98		<0.2		<0.24		<0.98		<0.39	
		8/18/2015	<1.0		<0.30		<0.30		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		4.3		<1.0		<1.0		<1.0		<1.0	
		10/27/2015	2.5		0.17	J / J	<0.3	/ UJ	<1		<1	/ UJ	<1		<1		<1		<1	/ UJ	<1	/ UJ	<1		<1		6.6	/ J	0.89	J /
		4/26/2016	0.56	J/J	< 0.30		< 0.30		< 1.0		< 1.0		< 1.0	/UJ	< 1.0		< 1.0		< 1.0		< 1.0		**3.6**	/J	< 1.0		**5.7**	/J	2.1	/J
		10/4/2016	<1.0	/ UJ	<0.30	/ UJ	<0.30	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	2.9	/ J	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ
		4/21/2017	<1.0		<0.30		<0.30		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		3.7	/ J	1.3	/ J
		10/5/2017	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		0.31	J / J	0.57	J / J
		4/17/2018	<1		<0.3		<0.3		<1		<1		<1	/ UJ	2.4	/ J	<1		0.35	J / J	<1		<1		<1		<1		<1	
		10/4/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	

TABLE B1

Summary of Analytical Results - Explosives
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	**1,3-DNB**		**2,4-DNT**		**2,6-DNT**		**2-A-4,6-DNT**		**4-A-2,6-DNT**		**HMX**		**NB**		**2-NT**		**3-NT**		**4-NT**		**RDX**		**Tetryl**		**1,3,5-TNB**		**2,4,6-TNT**	
		Units	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
		Project Action Limit[1]	10		0.42		0.42		NS		NS		5100		51		5100		NS		NS		2.6		200		5.1		9.5	
		Surface Water RG[2]	4		330		150		NS		NS		260		8000		62		NS		NS		500		NS		15		75	
Site	**Well**	**Date**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**
		Early Warning																												
	MW654	10/22/2004	<0.4		**3**		**1.9**		1.6		2		<0.81		<0.4		3.3		<0.81		1.8		<0.4		<0.81		<0.4		<0.4	
		7/13/2005	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		10/18/2005	<0.39		**0.55**		<0.78		<0.78		0.85		<0.78		<0.39		1.1		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		5/2/2006	<0.39		<0.39		<0.78		<0.78		0.88		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		10/6/2006	<0.46		**1.2**		<0.91		<0.91		1.2		<0.91		<0.46		1.3		<0.91		<0.91		<0.46		<0.91		<0.46		<0.46	
		4/24/2007	<0.39		**0.95**		<0.78		1.7		3.2		<0.78		<0.39		1.2		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		10/10/2007	<0.44		<0.44		<0.87		1.6		3		<0.87		<0.44		<0.87		<0.87		<0.87		**3.4**		<0.87		<0.44		<0.44	
		5/6/2008	<0.47		<0.47		<0.94		1.4		2.6		<0.94		<0.47		<0.94		<0.94		<0.94		0.55		<0.94		<0.47		<0.47	
		10/16/2008	<0.66		<0.66		<1.3		<1.3		<1.3		<1.3		<0.66		<1.3		<1.3		<1.3		<0.66		<1.3		<0.66		<0.66	
		10/16/2008 (DUP)	<0.39		<0.39		<0.78		<0.78		1.7		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		5/7/2009	<0.16		<0.31		<0.31		2.2		5.8		<0.31	U / UJ	<0.16		<0.31		<0.31		<0.31		0.7		<0.39		<0.16		<0.16	
		10/26/2009	<0.21		**0.63**		0.25	F /	0.36	F /	0.69		<0.41		<0.21		1.6		<0.41		0.58		<0.21		<0.52		<0.21		<0.21	
		4/9/2010	<0.26		<0.51		<0.51		1.3		4.4		<0.51		<0.26		<0.51		<0.51		<0.51		0.7		<0.64		<0.26		<0.26	
		11/2/2010	<0.16		0.084	F /	0.1	F /	0.19	F /	1		<0.31		<0.16		0.7		<0.31		0.25	F /	<0.16		<0.39	U / UJ	<0.16		<0.16	
		4/21/2011	<0.20		<0.38		<0.38		0.81		3		<0.38		<0.20		0.35	F /	<0.38		<0.38		<0.20		<0.48	U / UJ	<0.20		<0.20	
		10/19/2011	<0.20		<0.20		<0.20		<0.38		<0.38		<0.38		<0.20		<0.38		<0.38		<0.38		<0.20		<0.48		<0.20		<0.20	
		4/15/2012	<0.16		**1.7**		**0.97**		0.7		2.2		<0.31		<0.16		18		0.23	F / J	11		0.31	/ J	<0.39		<0.16		0.18	/ J
		10/23/2012	<1.6		**8.9**		**4.8**		<3.1		<3.1		<3.1		<1.6		86		<3.1		52		<1.6		<3.9		<1.6		<1.6	
		4/11/2013	<0.38	U / UJ	0.085	F / JJ	0.11	F / JJ	0.76	/ J	0.82	/ JJ	<0.38	U / UJ	<0.38	U / UJ	0.23	F / J	<0.38	U / UJ	<0.95	U / UJ	0.15	F / JJ	<0.23	U / UJ	0.32	F / JJ	<0.38	U / UJ
		10/17/2013	<0.41		0.12	F / J	<0.21		0.41		0.54	/ J	<0.41		<0.41		0.31	F / J	<0.41		<1		<0.21		<0.25		<1		<0.41	
		10/22/2014	<0.39		<0.39		<0.19		<0.19		<0.19		<0.39		<0.39		<0.39		<0.39		<0.97		<0.19		<0.23	U / UJ	<0.97		<0.39	
		12/18/2014	<0.4		<0.4		<0.2		0.08	F / J	<0.2		<0.4		<0.41		0.22	F /	<0.41		<1		<0.2		<0.24		<1		<0.4	
		8/18/2015	<10		**810**		**230**		88		63		<10		3.2		3200		530		1300		<10		<10	/ UJ	<10		<10	
		10/27/2015	<5		**73**	/ J	**11**	/ J	12		<5		<5		<5		460	/ J	140	/ J	730	/ J	<5		<5		<5		<5	
		10/27/2015 (DUP)	<2	/ UJ	**30**	/ J	**4.5**	/ J	5.1	/ J	<2	/ UJ	<2	/ UJ	<2	/ UJ	230	/ J	69	/ J	240	/ J	<2	/ UJ	<2	/ UJ	<2	/ UJ	<2	/ UJ
		4/26/2016	1.4	J/	**630**		**370**		53		60		< 2.0	/UJ	< 2.0		210		100		200		< 2.0		1.2	J/	< 2.0		**53**	
		4/26/2016 (DUP)	1.4	J/J	**620**		**370**		53		58		< 2.0	/UJ	< 2.0		190		99		190		< 2.0		0.97	J/	< 2.0		**51**	
		10/4/2016	<20		**250**	/ J	**120**	/ J	49		33	/ J	<20		<20		420	/ J	71		290	/ J	<20		<20		<20		**14**	J /
		10/4/2016 (DUP)	<20		**340**	/ J	**170**	/ J	68		44	/ J	<20		<20		610	/ J	100		430	/ J	<20		<20		<20		**22**	
		4/20/2017	<1.0	/ UJ	<0.30	/ UJ	**15**	/ J	28	/ J	32		<1.0		<1.0	/ UJ	<1.0	/ UJ	1.3	/ J		/ R	0.32	J /	<1.0		<1.0		**10**	
		4/20/2017 (DUP)	<1.0		0.21	J / J	**14**		27		31		<1.0		<1.0		<1.0		1.2		<1.0		0.41	J /	<1.0		<1.0		**10**	
M6		10/5/2017	<1		**76**	/ J	**85**		42	/ J	55	/ J	<1		0.31	J /	81	/ J	15		44	/ J	<1		<1	/ J	<1		**13**	
		4/17/2018	<1		**1.6**		**1.5**	/ J	18		25		<1	/ UJ	<1		<1		<1		<1		<1		<1		<1		3.4	
		10/4/2018	<1		**9.1**		**9.1**		7		9.9		<1		<1		7.9		1.3		4.8		<1		0.51	J /	<1		<1	
		Compliance																												
	MW117	10/19/2004	<0.64		<0.64 (0.2)		<1.3 (0.23)		<1.3		<1.3		<1.3		<0.64		<1.3		<1.3		<1.3		<0.64		<1.3		<0.64		<0.64	
		7/14/2005	<0.44		<0.44		<0.87		<0.87		<0.87		<0.87		<0.44		<0.87		<0.87		<0.87		<0.44		<0.87		<0.44		<0.44	
		10/20/2005	<0.58		<0.58		<1.2		<1.2		<1.2		<1.2		<0.58		<1.2		<1.2		<1.2		<0.58		<1.2		<0.58		<0.58	
		5/3/2006	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		10/11/2006	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		4/30/2007	<0.43		<0.43		<0.86		<0.86		<0.86		<0.86		<0.43		<0.86		<0.86		<0.86		<0.43		<0.86		<0.43		<0.43	
		10/11/2007	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		5/9/2008	<0.44		<0.44		<0.87		<0.87		<0.87		<0.87		<0.44		1.4		<0.87		<0.87		<0.44		<0.87		<0.44		<0.44	
		5/8/2009	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		5/8/2009 (DUP)	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		10/22/2009	<0.18		<0.35		<0.35		<0.35		<0.35		<0.35		<0.18		<0.35		<0.35		<0.35		<0.18		<0.44		<0.18		<0.18	
		4/8/2010	<0.22		<0.43		<0.43		<0.43		<0.43		<0.43		<0.22		<0.43		<0.43		<0.43		<0.22		<0.54		<0.22		<0.22	
		11/1/2010	<0.21		<0.41		<0.41		<0.41		<0.41		<0.41		<0.21		<0.41		<0.41		<0.41		<0.21		<0.51		<0.21		<0.21	
		11/1/2010 (DUP)	<0.21		<0.41		<0.41		<0.41		<0.41		<0.41		<0.21		<0.41		<0.41		<0.41		<0.21		<0.52		<0.21		<0.21	
		4/20/2011	<0.20		<0.39		<0.39		<0.39		<0.39		<0.39		<0.20		<0.39		<0.39		<0.39		<0.20		<0.49		<0.20		<0.20	
		4/20/2011 (DUP)	<0.17		<0.33		<0.33		<0.33		<0.33		<0.33		<0.17		<0.33		<0.33		<0.33		<0.17		<0.42		<0.17		<0.17	
		10/17/2011	<0.40		<0.40		<0.40		<0.77		<0.77		<0.77		<0.40		<0.77		<0.77		<0.77		<0.40		<0.97		<0.40		<0.40	U / UJ
		4/13/2012	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31	U / UJ	<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		10/23/2012	<1.6	U / UJ	**2.6**	F / J	<3.1	U / UJ	<3.1	U / UJ	<3.1	U / UJ	<3.1	U / UJ	<1.6	U / UJ	24	/ J	<3.1	U / UJ	16	/ J	<1.6	U / UJ	<3.9	U / UJ	<1.6	U / UJ	<1.6	U / UJ
		4/10/2013	<0.4		<0.4		<0.2		<0.2		<0.2		<0.4		<0.4		<0.4		<0.4		<1		<0.2		<0.24		<1		<0.4	
		10/17/2013	<0.43	U / UJ	<0.32	U / UJ	<0.21	U / UJ	<0.21	U / UJ	<0.21	U / UJ	<0.43	U / UJ	<0.43		0.41	F / J	<0.43	U / UJ	<1.1	U / UJ	<0.21	U / UJ	<0.26	U / UJ	<1.1	U / UJ	<0.43	
		10/27/2014	<0.39		<0.39		<0.2		<0.2		<0.2		<0.39		<0.39		<0.39		<0.39		<0.98		<0.2		<0.24	U / UJ	<0.98		<0.39	
		12/15/2014	<0.39		<0.39		<0.2		<0.2		<0.2		<0.39		<0.39		<0.39		<0.39		<0.99		<0.2		<0.24	U / UJ	<0.99		<0.39	
		8/19/2015	<5.0	/ UJ	<1.5	/ UJ	<1.5	/ UJ	<5.0	/ UJ	<5.0	/ UJ	<5.0	/ UJ	<5.0	/ UJ	<5.0	/ UJ	<5.0	/ UJ	<5.0	/ UJ	<5.0	/ UJ	<5.0	/ UJ	<5.0	/ UJ	<5.0	/ UJ
		10/23/2015	<1.1	/ UJ	<0.34	/ UJ	<0.34	/ UJ	<1.1	/ UJ	<1.1	/ UJ	<1.1	/ UJ	<1.1	/ UJ	<1.1	/ UJ	<1.1	/ UJ	<1.1	/ UJ	<1.1	/ UJ	<1.1	/ UJ	<1.1	/ UJ	<1.1	/ UJ
		4/21/2016	< 1.0		< 0.30		< 0.30		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0	
		10/3/2016	<1.0		<0.30		<0.30		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		4/21/2017	<1.0	/ UJ	<0.30	/ UJ	<0.30	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	2.9	/ J	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ
		10/4/2017	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		4/13/2018	<1		<0.3		<0.3		<1		<1		<1	/ UJ	<1		<1		<1		<1		<1		<1		<1		<1	
		10/10/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	

TABLE B1

Summary of Analytical Results - Explosives
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	1,3-DNB		2,4-DNT		2,6-DNT		2-A-4,6-DNT		4-A-2,6-DNT		HMX		NB		2-NT		3-NT		4-NT		RDX		Tetryl		1,3,5-TNB		2,4,6-TNT	
		Units	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
		Project Action Limit[1]	10		0.42		0.42		NS		NS		5100		51		5100		NS		NS		2.6		200		5.1		9.5	
		Surface Water RG[2]	4		330		150		NS		NS		260		8000		62		NS		NS		500		NS		15		75	
Site	Well	Date	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF
		Compliance																												
M6 (Other Areas)	MW118	10/22/2004	<0.48		<0.48 (0.15)		<0.96 (0.18)		<0.96		<0.96		<0.96		<0.48		<0.96		<0.96		<0.96		<0.48		<0.96		<0.48		<0.48	
		7/13/2005	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		0.77	U /
		10/19/2005	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		5/3/2006	<0.52		<0.52		<1		<1		<1		<1		<0.52		<1		<1		<1		<0.52		<1		<0.52		<0.52	
		10/11/2006	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		4/30/2007	<0.4		<0.4		<0.81		<0.81		<0.81		<0.81		<0.4		<0.81		<0.81		<0.81		<0.4		<0.81		<0.4		<0.4	
		10/12/2007	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		5/6/2008	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		10/20/2008	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		5/8/2009	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		10/22/2009	<0.18		<0.34		<0.34		<0.34		<0.34		<0.34		<0.18		<0.34		<0.34		<0.34		<0.18		<0.43		<0.18		<0.18	
		4/8/2010	<0.23		<0.44		<0.44		<0.44		<0.44		<0.44		<0.23		<0.44		<0.44		<0.44		<0.23		<0.56		<0.23		<0.23	
		11/2/2010	<0.22		<0.43		<0.43		<0.43		<0.43		<0.43		<0.22		<0.43		<0.43		<0.43		<0.22		<0.55		<0.22		<0.22	
		4/20/2011	<0.18		<0.35		<0.35		<0.35		<0.35		<0.35		<0.18		<0.35		<0.35		<0.35		<0.18		<0.44		<0.18		<0.18	
		10/17/2011	<0.33		<0.33		<0.33		<0.65		<0.65		<0.65		<0.33		<0.65		<0.65		<0.65		<0.33		<0.81		<0.33		<0.33	U / UJ
		4/13/2012	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31	U / UJ	<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		10/23/2012	<1.6	U / UJ	**2.3**	F / J	<3.1	U / UJ	<3.1	U / UJ	<3.1	U / UJ	<3.1	U / UJ	<1.6	U / UJ	20	/ J	<3.1	U / UJ	15	/ J	<1.6	U / UJ	<3.9	U / UJ	<1.6	U / UJ	<1.6	U / UJ
		4/10/2013	<0.41		<0.41		<0.21		<0.21		<0.21		<0.41		<0.41		<0.41		<0.41		<1		<0.21		<0.25		<1		<0.41	
		10/17/2013	<0.43		<0.32		<0.21		<0.21		<0.21		<0.43		<0.43		1	/ J	<0.43		0.52	F / J	<0.21		<0.26		<1.1		<0.43	
		10/27/2014	<0.38		<0.38		<0.19		<0.19		<0.19		<0.38		<0.38		<0.38		<0.38		<0.94		<0.19		<0.23	U / UJ	<0.94		<0.38	
		12/15/2014	<0.38		<0.38		<0.19		<0.19		<0.19		<0.38		<0.38		<0.38		<0.38		<0.94		<0.19		<0.23	U / UJ	<0.94		<0.38	
		8/19/2015	<1.0		<0.30		<0.30		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/23/2015	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		4/21/2016	< 1.0		< 0.30		< 0.30		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0	
		10/3/2016	<1.0		<0.30		<0.30		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		4/21/2017	<1.0	/ UJ	<0.30	/ UJ	<0.30	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ
		10/4/2017	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		4/13/2018	<1		<0.3		<0.3		<1		<1		<1	/ UJ	<1		<1		<1		<1		<1		<1		<1		<1	
		10/10/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
	MW119	10/22/2004	<0.39		<0.39 (0.12)		<0.78 (0.14)		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		7/18/2005	<0.57		<0.57		<1.1		<1.1		<1.1		<1.1		<0.57		<1.1		<1.1		<1.1		<0.57		<1.1		<0.57		<0.57	
		10/21/2005	<0.52		<0.52		<1		<1		<1		<1		<0.52		<1		<1		<1		<0.52		<1		<0.52		<0.52	
		5/3/2006	<0.44		<0.44		<0.87		<0.87		<0.87		<0.87		<0.44		<0.87		<0.87		<0.87		<0.44		<0.87		<0.44		<0.44	
		10/9/2006	<0.49		<0.49		<0.99		<0.99		<0.99		<0.99		<0.49		<0.99		<0.99		<0.99		<0.49		<0.99		<0.49		<0.49	
		4/30/2007	<0.6		<0.6		<1.2		<1.2		<1.2		<1.2		<0.6		<1.2		<1.2		<1.2		<0.6		<1.2		<0.6		<0.6	
		10/10/2007	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		10/10/2007 (DUP)	<0.4		<0.4		<0.81		<0.81		<0.81		<0.81		<0.4		<0.81		<0.81		<0.81		<0.4		<0.81		<0.4		<0.4	
		5/6/2008	<0.72		<0.72		<1.4		<1.4		<1.4		<1.4		<0.72		<1.4		<1.4		<1.4		<0.72		<1.4		<0.72		<0.72	
		10/15/2008	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		5/7/2009	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31	U / UJ	<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		10/22/2009	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		4/8/2010	<0.17		<0.33		<0.33		<0.33		<0.33		<0.33		<0.17		<0.33		<0.33		<0.33		<0.17		<0.42		<0.17		<0.17	
		11/2/2010	<0.22		<0.43		<0.43		<0.43		<0.43		<0.43		<0.22		<0.43		<0.43		<0.43		<0.22		<0.55		<0.22		<0.22	
		4/20/2011	<0.20		<0.39		<0.39		<0.39		<0.39		<0.39		<0.20		<0.39		<0.39		<0.39		<0.20		<0.49		<0.20		<0.20	
		10/17/2011	<0.41		<0.41		<0.41		<0.80		<0.80		<0.80		<0.41		<0.80		<0.80		<0.80		<0.41		<1.0		<0.41		<0.41	U / UJ
		4/13/2012	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31	U / UJ	<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		10/23/2012	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		4/10/2013	<0.41		<0.41		<0.2		<0.2		<0.2		<0.41		<0.41		<0.41		<0.41		<1		<0.2		<0.25		<1		<0.41	
		10/17/2013	<0.43		<0.32		<0.21		<0.21		<0.21		<0.43		<0.43		0.11	F / J	<0.43		<1.1		<0.21		<0.26		<1.1		<0.43	
		10/27/2014	<0.39		<0.39		<0.19		<0.19		<0.19		<0.39		<0.39		<0.39		<0.39		<0.96		<0.19		<0.23	U / UJ	<0.96		<0.39	
		12/17/2014	<0.4		<0.4		<0.2		<0.2		<0.2		<0.4		<0.4		<0.4		<0.4		<0.99		<0.2		<0.24	U / UJ	<0.99		<0.4	
		8/19/2015	<1.0		<0.30		<0.30		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/23/2015	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		4/21/2016	< 1.0		< 0.30		< 0.30		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0	
		10/3/2016	<1.0		<0.30	/ UJ	<0.30	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		4/21/2017	<1.0	/ UJ	<0.30	/ UJ	<0.30	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ
		10/4/2017	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		4/13/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		10/10/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	

TABLE B1

Summary of Analytical Results - Explosives
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	**1,3-DNB**		**2,4-DNT**		**2,6-DNT**		**2-A-4,6-DNT**		**4-A-2,6-DNT**		**HMX**		**NB**		**2-NT**		**3-NT**		**4-NT**		**RDX**		**Tetryl**		**1,3,5-TNB**		**2,4,6-TNT**	
		Units	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
		Project Action Limit[1]	10		0.42		0.42		NS		NS		5100		51		5100		NS		NS		2.6		200		5.1		9.5	
		Surface Water RG[2]	4		330		150		NS		NS		260		8000		62		NS		NS		500		NS		15		75	
Site	**Well**	**Date**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**
M13													***Upgradient***																	
	MW806	5/15/2008	<0.56		<0.56		<1.1		<1.1		<1.1		<1.1		<0.56		<1.1		<1.1		<1.1		<0.56		<1.1		<0.56		<0.56	
		8/19/2008	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		10/21/2008	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		2/4/2009	<0.20		<0.38		<0.38		<0.38		<0.38		<0.38		<0.20		<0.38		<0.38		<0.38		<0.20		<0.48		<0.20		<0.20	
		5/5/2009	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		7/29/2009	<0.2		<0.38		<0.38		<0.38		<0.38		<0.38		<0.2		<0.38		<0.38		<0.38		<0.2		<0.48		<0.2		<0.2	
		10/28/2009	<0.19		<0.37		<0.37		<0.37		<0.37		<0.37		<0.19		<0.37		<0.37		<0.37		<0.19		<0.46		<0.19		<0.19	
		1/15/2010	<0.19		<0.36		<0.36		<0.36		<0.36		<0.36		<0.19		<0.36		<0.36		<0.36		<0.19		<0.46		<0.19		<0.19	
		4/14/2010	<0.20		<0.38		<0.38		<0.38		<0.38		<0.38		<0.20		<0.38		<0.38		<0.38		<0.20		<0.48		<0.20		<0.20	
		7/21/2010	<0.27		<0.52		<0.52		<0.52		<0.52		<0.52		<0.27		<0.52		<0.52		<0.52		<0.27		<0.65		<0.27		<0.27	
		10/28/2010	<0.25		<0.49		<0.49		<0.49		<0.49		<0.49		<0.25		<0.49		<0.49		<0.49		<0.25		<0.62		<0.25		<0.25	
		1/27/2011	<0.25		<0.49		<0.49		<0.49		<0.49		<0.49		<0.25		<0.49		<0.49		<0.49		<0.25		<0.62		<0.25		<0.25	
		4/19/2011	<0.24		<0.47		<0.47		<0.47		<0.47		<0.47		<0.24		<0.47		<0.47		<0.47		<0.24		<0.59		<0.24		<0.24	
		7/28/2011	<0.22		<0.22		<0.22		<0.42		<0.42		<0.42		<0.22		<0.42		<0.42		<0.42		<0.22		<0.53		<0.22		<0.22	
		10/12/2011	<0.31		<0.31		<0.31		<0.61		<0.61		<0.61		<0.31		<0.61		<0.61		<0.61		<0.31		<0.77		<0.31		<0.31	U / UJ
		2/29/2012	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		4/16/2012	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		7/17/2012	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		10/24/2012	<0.16		**1.4**		**0.96**		<0.31		<0.31		<0.31		<0.16		5.5		<0.31		5		<0.16		<0.39		<0.16		<0.16	
		1/31/2013	<0.4		<0.4		<0.2		<0.2		<0.2		<0.4		<0.4		<0.4		<0.4		<1		<0.2		<0.24		<1		<0.4	
		1/31/2013 (DUP)	<0.4		<0.4		<0.2		<0.2		<0.2		<0.4		<0.4		<0.4		<0.4		<1		<0.2		<0.24		<1		<0.4	
		4/9/2013	<0.45		<0.45		<0.22		<0.22		<0.22		<0.45		<0.45		<0.45		<0.45		<1.1		<0.22		<0.27		<1.1		<0.45	
		7/31/2013	<0.4		<0.3		<0.2		<0.2		<0.2		<0.4		<0.4		<0.4		<0.4		<1		<0.2		<0.24		<1		<0.4	
		10/15/2013	<0.36		<0.27		<0.18		<0.18		<0.18		<0.36		<0.36		<0.36		<0.36		<0.91		<0.18		<0.22		<0.91		<0.36	
		10/21/2014	<0.4		<0.4		<0.2		<0.2	U / UJ	<0.2		<0.4		<0.4		<0.4		<0.4		<1		<0.2		<0.24	U / UJ	<1		<0.4	
		11/19/2014	<0.38		<0.38		<0.19		<0.19	U / UJ	<0.19		<0.38		<0.38		<0.38		<0.38		<0.96		<0.19		<0.23		<0.96		<0.38	
		12/16/2014	<0.38		<0.38		<0.19		<0.19		<0.19		<0.38		<0.38		<0.38		<0.38		<0.95		<0.19		<0.23	U / UJ	<0.95		<0.38	
		8/19/2015	<1.0		<0.30		<0.30		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/26/2015	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		4/25/2016	< 1.0	/J	< 0.30		< 0.30		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0	
		10/5/2016	<1.0	/ UJ	<0.30	/ UJ	<0.30	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ
		4/24/2017	<1.0	/ UJ	<0.30	/ UJ	<0.30	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ
		10/10/2017	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		4/16/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		10/9/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
	MW807	5/15/2008	<0.41		<0.41		<0.82		<0.82		<0.82		<0.82		<0.41		<0.82		<0.82		<0.82		<0.41		<0.82		<0.41		<0.41	
		5/15/2008 (DUP)	<0.83		<0.83		<1.7		<1.7		<1.7		<1.7		<0.83		<1.7		<1.7		<1.7		<0.83		<1.7		<0.83		<0.83	
		8/19/2008	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		8/19/2008 (DUP)	<0.41		<0.41		<0.82		<0.82		<0.82		<0.82		<0.41		<0.82		<0.82		<0.82		<0.41		<0.82		<0.41		<0.41	
		10/21/2008	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		2/4/2009	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		5/5/2009	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		7/29/2009	<0.21		<0.41		<0.41		<0.41		<0.41		<0.41		<0.21		<0.41		<0.41		<0.41		<0.21		<0.51		<0.21		<0.21	
		10/28/2009	<0.22		<0.42		<0.42		<0.42		<0.42		<0.42		<0.22		<0.42		<0.42		<0.42		<0.22		<0.53		<0.22		<0.22	
		1/15/2010	<0.32		<0.61		<0.61		<0.61		<0.61		<0.61		<0.32		<0.61		<0.61		<0.61		<0.32		<0.77		<0.32		<0.32	
		4/14/2010	<0.17		<0.34		<0.34		<0.34		<0.34		<0.34		<0.17		<0.34		<0.34		<0.34		<0.17		<0.42		<0.17		<0.17	
		7/21/2010	<0.20		<0.39		<0.39		<0.39		<0.39		<0.39		<0.20		<0.39		<0.39		<0.39		<0.20		<0.49		<0.20		<0.20	
		10/28/2010	<0.21		<0.40		<0.40		<0.40		<0.40		<0.40		<0.21		<0.40		<0.40		<0.40		<0.21		<0.50		<0.21		<0.21	
		1/27/2011	<0.25		<0.48		<0.48		<0.48		<0.48		<0.48		<0.25		<0.48		<0.48		<0.48		<0.25		<0.60		<0.25		<0.25	
		4/19/2011	<0.22		<0.42		<0.42		<0.42		<0.42		<0.42		<0.22		<0.42		<0.42		<0.42		<0.22		<0.53		<0.22		<0.22	
		7/28/2011	<0.22		<0.22		<0.22		<0.42		<0.42		<0.42		<0.22		<0.42		<0.42		<0.42		<0.22		<0.53	U / UJ	<0.22		<0.22	
		10/12/2011	<0.23		<0.23		<0.23		<0.44		<0.44		<0.44		<0.23		<0.44		<0.44		<0.44		<0.23		<0.55		<0.23		<0.23	
		2/29/2012	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		4/16/2012	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	U / UJ
		7/17/2012	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		10/24/2012	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		1/31/2013	<0.4		<0.4		<0.2		<0.2		<0.2		<0.4		<0.4		<0.4		<0.4		<1		<0.2		<0.24		<1		<0.4	
		4/9/2013	<0.41	U / UJ	<0.41	U / UJ	<0.2	U / UJ	<0.2	U / UJ	<0.2	U / UJ	<0.41	U / UJ	<0.41	U / UJ	<0.41	U / UJ	<0.41	U / UJ	<1	U / UJ	<0.2	U / UJ	<0.24	U / UJ	<1	U / UJ	<0.41	U / UJ
		7/31/2013	<0.41		<0.31		<0.2		<0.2		<0.2		<0.41		<0.41		<0.41		<0.41		<1		<0.2		<0.24		<1		<0.41	
		10/15/2013	<0.36		<0.27		<0.18		<0.18		<0.18		<0.36		<0.36		<0.36		<0.36		<0.91		<0.18		<0.22		<0.91		<0.36	
		10/21/2014	<0.4		<0.4		<0.2		<0.2	U / UJ	<0.2		<0.4		<0.4		<0.4		<0.4		<1		<0.2		<0.24	U / UJ	<1		<0.4	
		11/19/2014	<0.4		<0.4		<0.2		<0.2	U / UJ	<0.2		<0.4		<0.4		<0.4		<0.4		<0.99		<0.2		<0.24		<0.99		<0.4	
		12/16/2014	<0.38		<0.38		<0.19		<0.19		<0.19		<0.38		<0.38		<0.38		<0.38		<0.96		<0.19		<0.23	U / UJ	<0.96		<0.38	
		8/19/2015	<1.0		<0.30		<0.30		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/26/2015	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		4/25/2016	< 1.0		< 0.30		< 0.30		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0	
		10/5/2016	<1.0		<0.30		<0.30		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		4/24/2017	<1.0		<0.30		<0.30		<1.0		<1.0		<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/10/2017	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		4/16/2018	<1		<0.3		<0.3		<1		<1		<1	/ UJ	<1		<1		<1		<1		<1		<1		<1		<1	
		10/9/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	

TABLE B1

Summary of Analytical Results - Explosives
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	**1,3-DNB**		**2,4-DNT**		**2,6-DNT**		**2-A-4,6-DNT**		**4-A-2,6-DNT**		**HMX**		**NB**		**2-NT**		**3-NT**		**4-NT**		**RDX**		**Tetryl**		**1,3,5-TNB**		**2,4,6-TNT**	
		Units	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
		Project Action Limit[1]	10		0.42		0.42		NS		NS		5100		51		5100		NS		NS		2.6		200		5.1		9.5	
		Surface Water RG[2]	4		330		150		NS		NS		260		8000		62		NS		NS		500		NS		15		75	
Site	**Well**	**Date**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**
		Downgradient																												
M13	MW126R	5/20/2008	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		8/20/2008	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		10/22/2008	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		2/5/2009	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		5/5/2009	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		7/28/2009	<0.26		<0.51		<0.51		<0.51		<0.51		<0.51		<0.26		<0.51		<0.51		<0.51		<0.26		<0.64		<0.26		<0.26	
		10/29/2009	<0.23		<0.45		<0.45		<0.45		<0.45		<0.45		<0.23		<0.45		<0.45		<0.45		<0.23		<0.57		<0.23		<0.23	
		1/14/2010	<0.29		<0.55		<0.55		<0.55		<0.55		<0.55		<0.29		<0.55		<0.55		<0.55		<0.29		<0.70		<0.29		<0.29	
		4/14/2010	<0.20		<0.39		<0.39		<0.39		<0.39		<0.39		<0.20		<0.39		<0.39		<0.39		<0.20		<0.49		<0.20		<0.20	
		4/14/2010 (DUP)	<0.51		<0.98		<0.98		<0.98		<0.98		<0.98		<0.51		<0.98		<0.98		<0.98		<0.51		<1.2		<0.51		<0.51	
		7/20/2010	<0.21		<0.41		<0.41		<0.41		<0.41		<0.41		<0.21		<0.41		<0.41		<0.41		<0.21		<0.51		<0.21		<0.21	
		10/28/2010	<0.22		<0.43		<0.43		<0.43		<0.43		<0.43		<0.22		<0.43		<0.43		<0.43		<0.22		<0.54		<0.22		<0.22	
		1/28/2011	<0.27		<0.52		<0.52		<0.52		<0.52		<0.52		<0.27		<0.52		<0.52		<0.52		<0.27		<0.65		<0.27		<0.27	
		4/19/2011	<0.46		<0.90		<0.90		<0.90		<0.90		<0.90		<0.46		<0.90		<0.90		<0.90		<0.46		<1.1		<0.46		<0.46	
		7/28/2011	<0.28		<0.28		<0.28		<0.54		<0.54		<0.54		<0.28		<0.54		<0.54		<0.54		<0.28		<0.68	U / UJ	<0.28		<0.28	
		10/13/2011	<0.31		<0.31		<0.31		<0.61		<0.61		<0.61		<0.31		<0.61		<0.61		<0.61		<0.31		<0.77		<0.31		<0.31	
		2/29/2012	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		4/16/2012	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		0.35		<0.31		0.3	F /	<0.16		<0.39		<0.16		<0.16	
		7/17/2012	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		10/25/2012	<0.16		**1.1**		**0.62**		<0.31		<0.31		<0.31		<0.16		2.1		0.17	F / J	2.4		<0.16		<0.39		0.22		<0.16	
		1/30/2013	<0.41		<0.41		<0.2		<0.2		<0.2		<0.41		<0.41		<0.41		<0.41		<1		<0.2		<0.24		<1		<0.41	
		4/9/2013	<0.41	U / UJ	<0.41	U / UJ	<0.2	U / UJ	<0.2	U / UJ	<0.2	U / UJ	<0.41	U / UJ	<0.41	U / UJ	<0.41	U / UJ	<0.41	U / UJ	<1	U / UJ	<0.2	U / UJ	<0.24	U / UJ	<1	U / UJ	<0.41	U / UJ
		7/31/2013	<0.4		<0.3		<0.2		<0.2		<0.2		<0.4		<0.4		<0.4		<0.4		<0.99		<0.2		<0.24		<0.99		<0.4	
		10/15/2013	<0.37		<0.28		<0.19		<0.19		<0.19		<0.37		<0.37		<0.37		<0.37		<0.93		<0.19		<0.22		<0.93		<0.37	
		10/21/2014	<0.4		<0.4		<0.2		<0.2	U / UJ	<0.2		<0.4		<0.4		<0.4		<0.4		<0.99		<0.2		<0.24	U / UJ	<0.99		<0.4	
		11/19/2014	<0.39		<0.39		<0.19		<0.19	U / UJ	<0.19		<0.39		<0.39		<0.39		<0.39		<0.97		<0.19		<0.23		<0.97		<0.39	
		12/16/2014	<0.38		<0.38		<0.19		<0.19		<0.19		<0.38		<0.38		<0.38		<0.38		<0.94		<0.19		<0.23	U / UJ	<0.94		<0.38	
		8/20/2015	<1.0	/ UJ	<0.30	/ UJ	<0.30	/ UJ	<1.0		<1.0	/ UJ	<1.0		<1.0	/ UJ	<1.0		<1.0	/ UJ	<1.0		<1.0		<1.0		<1.0	/ UJ	<1.0	
		10/26/2015	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		4/25/2016	< 1.0		< 0.30		< 0.30		< 1.0	/UJ	< 1.0	/UJ	< 1.0		< 1.0		< 1.0	/UJ	< 1.0	/UJ	< 1.0		< 1.0		< 1.0		< 1.0		< 1.0	
		10/5/2016	<1.0		<0.30		<0.30		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		4/24/2017	<1.1	/ UJ	<0.33	/ UJ	<0.33	/ UJ	<1.1	/ UJ	<1.1	/ UJ	<1.1	/ UJ	<1.1	/ UJ	<1.1	/ UJ	<1.1	/ UJ	<1.1	/ UJ	<1.1	/ UJ	<1.1	/ UJ	<1.1	/ UJ	<1.1	/ UJ
		10/10/2017	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		4/16/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		10/9/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		10/9/2018 (DUP)	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	

TABLE B1

Summary of Analytical Results - Explosives
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	**1,3-DNB**		**2,4-DNT**		**2,6-DNT**		**2-A-4,6-DNT**		**4-A-2,6-DNT**		**HMX**		**NB**		**2-NT**		**3-NT**		**4-NT**		**RDX**		**Tetryl**		**1,3,5-TNB**		**2,4,6-TNT**	
		Units	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
		Project Action Limit[1]	10		0.42		0.42		NS		NS		5100		51		5100		NS		NS		2.6		200		5.1		9.5	
		Surface Water RG[2]	4		330		150		NS		NS		260		8000		62		NS		NS		500		NS		15		75	
Site	**Well**	**Date**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**
		Downgradient																												
M13	MW362	5/13/2008	<0.45		<0.45		<0.9		1.3		1.1		<0.9		<0.45		<0.9		<0.9		<0.9		<0.45		<0.9		<0.45		<0.45	
		8/20/2008	<0.44		<0.44		<0.88		<0.88		<0.88		<0.88		<0.44		<0.88		<0.88		<0.88		<0.44		<0.88		<0.44		<0.44	
		10/22/2008	<0.39		**0.55**		<0.78		1.1		0.91		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		2/5/2009	<0.16		**7.1**		<0.31		1.5		1.2		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		5/5/2009	<0.16		<0.31		<0.31		0.94		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		7/28/2009	<0.17		<0.33		<0.33		<0.33		<0.33		<0.33		<0.17		<0.33		<0.33		<0.33		<0.17		<0.42		<0.17		<0.17	
		10/29/2009	<0.17		**4.3**		0.42		0.96		0.75		<0.34		<0.17		<0.34		<0.34		<0.34		<0.17		<0.42		<0.17		<0.17	
		1/14/2010	<0.30		**6.5**		<0.58		1.4		1.1		<0.58		<0.30		<0.58		<0.58		<0.58		<0.30		<0.73		<0.30		<0.30	
		1/14/2010 (DUP)	<0.19		**6.4**		<0.37		1.3		1.1		<0.37		<0.19		<0.37		<0.37		<0.37		<0.19		<0.47		<0.19		<0.19	
		4/14/2010	<0.24		**5**		<0.47		1.6		1.3		<0.47		<0.24		<0.47		<0.47		<0.47		<0.24		<0.59		<0.24		<0.24	
		7/20/2010	<0.22		**3.3**		<0.42		1.6		1.3		<0.42		<0.22		<0.42		<0.42		<0.42		<0.22		<0.53		<0.22		<0.22	
		10/28/2010	<0.25		**7.2**		<0.48		1.7		1.3		<0.48		<0.25		<0.48		<0.48		<0.48		<0.25		<0.60		<0.25		<0.25	
		1/28/2011	<0.23		**7.5**		**0.78**		1.9		1.7		<0.44		<0.23		<0.44		<0.44		<0.44		<0.23		<0.56		<0.23		<0.23	
		4/19/2011	<0.18		**3.2**		**1.2**		1.7		1.4		<0.34		<0.18		<0.34		<0.34		<0.34		<0.18		<0.43		<0.18		<0.18	
		7/28/2011	<0.44		**3.3**		**0.65**		1.4		1.2		<0.85		<0.44		<0.85		<0.85		<0.85		**4.8**		<1.1	U / UJ	<0.44		<0.44	
		10/13/2011	<0.26		**2.9**		0.36		<0.51		<0.51		<0.51		<0.26		<0.51		<0.51		<0.51		<0.26		<0.64		<0.26		<0.26	
		2/29/2012	<0.16		**1.5**		<0.31		0.83		0.78		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		4/16/2012	<0.16		**4.9**		<0.31		1.2		1.1		<0.31		<0.16		0.24	F / J	<0.31		<0.31	U / UJ	<0.16		<0.39		<0.16		0.073	F /
		4/16/2012 (DUP)	<0.16		**5.4**		<0.31		1.2		1		<0.31		<0.16		2	/ J	0.19	F /	1.9	/ J	<0.16		<0.39		<0.16		0.097	F /
		7/17/2012	<0.16		**3.6**		**0.68**		1.6		1.3		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		10/25/2012	<0.16		**6.7**		**1**		1.4		0.97		<0.31		<0.16		1.6		0.16	F /	1.9		**13**		<0.39		<0.16		0.08	F /
		1/30/2013	<0.41	U / UJ	**7.3**	/ J	0.33	/ J	1.2	/ J	0.97	/ J	<0.41	U / UJ	<0.41	U / UJ	<0.41	U / UJ	<0.41	U / UJ	<1	U / UJ	<0.21	U / UJ	<0.25	U / UJ	<1	U / UJ	<0.41	U / UJ
		4/9/2013	<0.4	U / UJ	**3.9**	/ J	0.26	/ JJ	0.82	/ JJ	0.61	/ JJ	<0.4	U / UJ	<0.4	U / UJ	<0.4	U / UJ	<0.4	U / UJ	<1	U / UJ	<0.2	U / UJ	<0.24	U / UJ	2.5	/ UJ	<0.4	U / UJ
		4/9/2013 (DUP)	<0.41		**3.6**		0.25	/ J	0.78		0.6	/ J	<0.41		<0.41		<0.41		<0.41		<1		<0.2		<0.24		2.4		<0.41	
		7/31/2013	<0.4		**2.3**		0.27		0.66		0.49	/ J	<0.4		<0.4		<0.4		<0.4		<1		<0.2		<0.24		<1		<0.4	
		10/15/2013	<0.37		**6.5**		0.38	/ J	1.1	/ J	0.85	/ J	<0.37		<0.37		0.1	F / J	<0.37		<0.94		<0.19		<0.22		4.2	/ J	<0.37	
		10/15/2013 (DUP)	<0.37		**7.5**		**0.67**		1.5		1.2		<0.37		<0.37		<0.37		<0.37		<0.93		<0.19		<0.22		<0.93		0.15	F /
		10/21/2014	<0.39		**5.7**	/ J	0.42	/ J	1.1	/ J	0.93	/ J	<0.39		<0.39		<0.39		<0.39		<0.98		<0.2		<0.24	U / UJ	<0.98		<0.39	
		10/21/2014 (DUP)	<0.4		**5.6**	/ J	**0.43**	/ J	1.1	/ J	0.83	/ J	<0.4		<0.4		<0.4		<0.4		<1		<0.2		<0.24	U / UJ	<1		<0.4	
		11/19/2014	<0.38		**7**	/ J	**0.52**	/ J	1.3	/ J	0.9	/ J	<0.38		<0.38		0.084	F / J	<0.38		<0.95		<0.19		<0.23		<0.95		<0.38	
		11/19/2014 (DUP)	<0.4		**7.3**	/ J	**0.56**	/ J	1.4	/ J	1	/ J	<0.4		<0.4		<0.4		<0.4		<0.99		<0.2		<0.24		<0.99		<0.4	
		12/16/2014	<0.39		**7.4**	/ J	**0.6**	/ J	1.4	/ J	1.2	/ J	<0.39		<0.39		<0.39		<0.39		<0.97		<0.19		<0.23	U / UJ	<0.97		<0.39	
		12/16/2014 (DUP)	<0.4		**7.1**	/ J	**0.54**	/ J	1.3	/ J	1	/ J	<0.4		<0.4		<0.4		<0.4		<0.99		<0.2		<0.24	U / UJ	<0.99		<0.4	
		8/20/2015	<1.0		**5.6**		**0.52**		1.2		0.94	J	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		8/20/2015 (DUP)	<1.0		**6**		**0.53**		1.2		0.94	J	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/26/2015	<1		**7.6**		<0.3		1.4		1.1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		10/26/2015 (DUP)	<1		**6.9**		<0.3		1.4		0.94	J /	<1		<1		<1		<1		<1		<1		<1		<1		<1	
		4/25/2016	< 1.0		**6.1**		< 0.30		1.3		0.87	J/	< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0	
		4/25/2016 (DUP)	< 1.0		**6.2**		< 0.30		1.3		0.95	J/	< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		0.37	J/J	< 1.0	
		10/5/2016	<1.0		**4**		<0.30		<1.0		0.32	JP / J	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/5/2016 (DUP)	<5.0		**3.8**		<1.5		<5.0		<5.0		<5.0		<5.0		<5.0		<5.0		<5.0		<5.0		<5.0		<5.0		<5.0	
		4/24/2017	<1.0		**5.3**		<0.30		1.1		0.68	J /	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		4/24/2017 (DUP)	<1.0		**5.9**		<0.30		1.2		0.66	J /	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/10/2017	<1		**7.1**		**0.52**		1.4		1.2		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		10/10/2017 (DUP)	<1		**6.8**		**0.52**		1.5		1.2		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		4/16/2018	<1		**4**	/ J	**0.45**	/ J	1.2		1		<1	/ UJ	<1		<1		<1		<1		<1		<1		<1		<1	
		4/16/2018 (DUP)	<1		**5.6**	/ J	**0.48**		1.3		0.96	J /	<1	/ UJ	<1		<1		<1		<1		<1		<1		<1		<1	
		10/9/2018	<1		**6.7**		**0.52**		1.4		1.1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		10/9/2018 (DUP)	<1		**6.9**		**0.55**		1.4		1		<1		<1		<1		<1		<1		<1		<1		<1		<1	

TABLE B1

Summary of Analytical Results - Explosives
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Joliet Army Ammunition Plant
Will County, Illinois

		Compound	**1,3-DNB**		**2,4-DNT**		**2,6-DNT**		**2-A-4,6-DNT**		**4-A-2,6-DNT**		**HMX**		**NB**		**2-NT**		**3-NT**		**4-NT**		**RDX**		**Tetryl**		**1,3,5-TNB**		**2,4,6-TNT**	
		Units	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
		Project Action Limit[1]	10		0.42		0.42		NS		NS		5100		51		5100		NS		NS		2.6		200		5.1		9.5	
		Surface Water RG[2]	4		330		150		NS		NS		260		8000		62		NS		NS		500		NS		15		75	
Site	**Well**	**Date**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**
		Downgradient																												
M13	MW808	5/15/2008	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		8/19/2008	<0.44		<0.44		<0.87		<0.87		<0.87		<0.87		<0.44		<0.87		<0.87		<0.87		<0.44		<0.87		<0.44		<0.44	
		10/21/2008	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		10/21/2008 (DUP)	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		2/4/2009	<0.21		<0.40		<0.40		<0.40		<0.40		<0.40		<0.21		<0.40		<0.40		<0.40		<0.21		<0.51		<0.21		<0.21	
		2/4/2009 (DUP)	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		5/4/2009	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		5/4/2009 (DUP)	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		7/29/2009	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		10/29/2009	<0.18		<0.35		<0.35		<0.35		<0.35		<0.35		<0.18		<0.35		<0.35		<0.35		<0.18		<0.44		<0.18		<0.18	
		1/15/2010	<0.20		<0.39		<0.39		<0.39		<0.39		<0.39		<0.20		<0.39		<0.39		<0.39		<0.20		<0.49		<0.20		<0.20	
		4/13/2010	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		7/20/2010	<0.28		<0.54		<0.54		<0.54		<0.54		<0.54		<0.28		<0.54		<0.54		<0.54		<0.28		<0.68		<0.28		<0.28	
		7/20/2010 (DUP)	<0.19		<0.38		<0.38		<0.38		<0.38		<0.38		<0.19		<0.38		<0.38		<0.38		<0.19		<0.47		<0.19		<0.19	
		10/29/2010	<0.40		<0.78		<0.78		<0.78		<0.78		<0.78		<0.40		<0.78		<0.78		<0.78		<0.40		<0.98		<0.40		<0.40	
		1/27/2011	<0.24		<0.46		<0.46		<0.46		<0.46		<0.46		<0.24		<0.46		<0.46		<0.46		<0.24		<0.58		<0.24		<0.24	
		1/27/2011 (DUP)	<0.30		<0.58		<0.58		<0.58		<0.58		<0.58		<0.30		<0.58		<0.58		<0.58		<0.30		<0.73		<0.30		<0.30	
		4/18/2011	<0.20		<0.38		<0.38		<0.38		<0.38		<0.38		<0.20		<0.38		<0.38		<0.38		<0.20		<0.48		<0.20		<0.20	
		4/18/2011 (DUP)	<0.22		<0.43		<0.43		<0.43		<0.43		<0.43		<0.22		<0.43		<0.43		<0.43		<0.22		<0.54		<0.22		<0.22	
		7/28/2011	<0.25		<0.25		<0.25		<0.48		<0.48		<0.48		<0.25		<0.48		<0.48		<0.48		<0.25		<0.60		<0.25		<0.25	
		7/28/2011 (DUP)	<0.24		<0.24		<0.24		<0.46		<0.46		<0.46		<0.24		<0.46		<0.46		<0.46		<0.24		<0.58		<0.24		<0.24	
		10/12/2011	<0.19		<0.19		<0.19		<0.38		<0.38		<0.38		<0.19		<0.38		<0.38		<0.38		<0.19		<0.47		<0.19		<0.19	
		2/29/2012	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		4/16/2012	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		7/18/2012	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		7/18/2012 (DUP)	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		10/25/2012	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		1/30/2013	<0.41		<0.41		<0.2		<0.2		<0.2		<0.41		<0.41		<0.41		<0.41		<1		<0.2		<0.24		<1		<0.41	
		4/9/2013	<0.41	U / UJ	<0.41	U / UJ	<0.2	U / UJ	<0.2	U / UJ	<0.2	U / UJ	<0.41	U / UJ	<0.41	U / UJ	<0.41	U / UJ	<0.41	U / UJ	<1	U / UJ	<0.2	U / UJ	<0.24	U / UJ	<1	U / UJ	<0.41	U / UJ
		7/31/2013	<0.4		<0.3		<0.2		<0.2		<0.2		<0.4		<0.4		<0.4		<0.4		<1		<0.2		<0.24		<1		<0.4	
		10/15/2013	<0.37		<0.27		<0.18		<0.18		<0.18		<0.37		<0.37		<0.37		<0.37		<0.91		<0.18		<0.22		<0.91		<0.37	
		10/20/2014	<0.41		<0.41		<0.2		<0.2	U / UJ	<0.2		<0.41		<0.41		<0.41		<0.41		<1		<0.2		<0.24	U / UJ	<1		<0.41	
		11/18/2014	<0.38		<0.38		<0.19		<0.19		<0.19		<0.38		<0.38		<0.38		<0.38		<0.94		<0.19		<0.23		<0.94		<0.38	
		12/15/2014	<0.39		<0.39		<0.19		<0.19		<0.19		<0.39		<0.39		<0.39		<0.39		<0.97		<0.19		<0.23	U / UJ	<0.97		<0.39	
		8/19/2015	<1.0	/ UJ	<0.30	/ UJ	<0.30	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ
		10/26/2015	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		4/25/2016	< 1.0		< 0.30		< 0.30		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0	
		10/5/2016	<1.0		<0.30		<0.30		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		4/24/2017	<1.0	/ UJ	<0.30	/ UJ	<0.30	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ
		10/10/2017	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		4/16/2018	<1		<0.3		<0.3		<1		<1		<1	/ UJ	<1		<1		<1		<1		<1		<1		<1		<1	
		10/9/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	

TABLE B1

Summary of Analytical Results - Explosives
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	1,3-DNB		2,4-DNT		2,6-DNT		2-A-4,6-DNT		4-A-2,6-DNT		HMX		NB		2-NT		3-NT		4-NT		RDX		Tetryl		1,3,5-TNB		2,4,6-TNT	
		Units	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
		Project Action Limit[1]	10		0.42		0.42		NS		NS		5100		51		5100		NS		NS		2.6		200		5.1		9.5	
		Surface Water RG[2]	4		330		150		NS		NS		260		8000		62		NS		NS		500		NS		15		75	
Site	Well	Date	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF
		Downgradient																												
M13	MW809	5/15/2008	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		8/19/2008	<0.4		<0.4		<0.81		<0.81		<0.81		<0.81		<0.4		<0.81		<0.81		<0.81		<0.4		<0.81		<0.4		<0.4	
		10/21/2008	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		2/5/2009	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		5/5/2009	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		7/29/2009	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		10/29/2009	<0.25		<0.49		<0.49		<0.49		<0.49		<0.49		<0.25		<0.49		<0.49		<0.49		<0.25		<0.62		<0.25		<0.25	
		10/29/2009 (DUP)	<0.22		<0.42		<0.42		<0.42		<0.42		<0.42		<0.22		<0.42		<0.42		<0.42		<0.22		<0.53		<0.22		<0.22	
		1/15/2010	<0.22		<0.43		<0.43		<0.43		<0.43		<0.43		<0.22		<0.43		<0.43		<0.43		<0.22		<0.54		<0.22		<0.22	
		4/13/2010	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		7/20/2010	<0.21		<0.41		<0.41		<0.41		<0.41		<0.41		<0.21		<0.41		<0.41		<0.41		<0.21		<0.51		<0.21		<0.21	
		10/29/2010	<0.24		<0.46		<0.46		<0.46		<0.46		<0.46		<0.24		<0.46		<0.46		<0.46		<0.24		<0.58		<0.24		<0.24	
		10/29/2010 (DUP)	<0.24		<0.47		<0.47		<0.47		<0.47		<0.47		<0.24		<0.47		<0.47		<0.47		<0.24		<0.59		<0.24		<0.24	
		1/27/2011	<0.21		<0.41		<0.41		<0.41		<0.41		<0.41		<0.21		<0.41		<0.41		<0.41		<0.21		<0.52		<0.21		<0.21	
		4/19/2011	<0.24		<0.47		<0.47		<0.47		<0.47		<0.47		<0.24		<0.47		<0.47		<0.47		<0.24		<0.59		<0.24		<0.24	
		7/28/2011	<0.23		<0.23		<0.23		<0.44		<0.44		<0.44		<0.23		<0.44		<0.44		<0.44		<0.23		<0.55		<0.23		<0.23	
		10/12/2011	<0.26		<0.26		<0.26		<0.51		<0.51		<0.51		<0.26		<0.51		<0.51		<0.51		<0.26		<0.64		<0.26		<0.26	
		10/12/2011 (DUP)	<0.24		<0.24		<0.24		<0.46		<0.46		<0.46		<0.24		<0.46		<0.46		<0.46		<0.24		<0.58		<0.24		<0.24	
		2/29/2012	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		2/29/2012 (DUP)	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		4/16/2012	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		7/18/2012	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		10/25/2012	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		10/25/2012 (DUP)	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		1/30/2013	<0.41		0.1	F /	<0.2		<0.2		<0.2		<0.41		<0.41		<0.41		<0.41		<1		<0.2		<0.24		<1		<0.41	
		4/9/2013	<0.43		<0.43		<0.21		<0.21		<0.21		<0.43		<0.43		<0.43		<0.43		<1.1		<0.21		<0.26		<1.1		<0.43	
		7/31/2013	<0.39		<0.29		<0.2		<0.2		<0.2		<0.39		<0.39		<0.39		<0.39		<0.98		<0.2		<0.24		<0.98		<0.39	
		7/31/2013 (DUP)	<0.4		<0.3		<0.2		<0.2		<0.2		<0.4		<0.4		<0.4		<0.4		<0.99		<0.2		<0.24		<0.99		<0.4	
		10/15/2013	<0.36		<0.27		<0.18		<0.18		<0.18		<0.36		<0.36		<0.36		<0.36		<0.9		<0.18		<0.22		<0.9		<0.36	
		10/20/2014	<0.4		<0.4		<0.2		<0.2	U / UJ	<0.2		<0.4		<0.4		<0.4		<0.4		<1		<0.2		<0.24	U / UJ	<1		<0.4	
		11/18/2014	<0.37		<0.37		<0.19		<0.19	U / UJ	<0.19		<0.37		<0.37		<0.37		<0.37		<0.93		<0.19		<0.22	U / UJ	<0.93		<0.37	
		12/15/2014	<0.38		<0.38		<0.19		<0.19		<0.19		<0.38		<0.38		<0.38		<0.38		<0.94		<0.19		<0.23	U / UJ	<0.94		<0.38	
		8/19/2015	<1.0		<0.30		<0.30		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/26/2015	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		4/25/2016	< 1.0		< 0.30		< 0.30		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0	
		10/5/2016	<1.0	/ UJ	<0.30	/ UJ	<0.30	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ
		4/24/2017	<1.0		<0.30		<0.30		<1.0		<1.0		<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/10/2017	<1	/ UJ	<0.3	/ UJ	<0.3	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ
		4/16/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		10/9/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
	MW811	10/29/2014	<0.4		<0.4		<0.2		<0.2		<0.2		<0.4		<0.4		<0.4		<0.4		<1		<0.2		<0.24	U / UJ	<1		<0.4	
		11/19/2014	<0.38		<0.38		<0.19		<0.19	U / UJ	<0.19		<0.38		<0.38		<0.38		<0.38		<0.96		<0.19		<0.23		<0.96		<0.38	
		12/16/2014	<0.38		<0.38		<0.19		<0.19		<0.19		<0.38		<0.38		<0.38		<0.38		<0.95		<0.19		<0.23	U / UJ	<0.95		<0.38	
		8/19/2015	<1.0		<0.30		<0.30		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/26/2015	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		4/25/2016	< 1.0		< 0.30		< 0.30		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0	
		10/5/2016	<1.0		<0.30		<0.30		<1.0		<1.0		<1.0		<1.0		<1.0	/ UJ	<1.0	/ UJ	<1.0		<1.0		<1.0		<1.0		<1.0	
		4/24/2017	<1.0		<0.30		<0.30		<1.0		<1.0		<1.0	/ UJ	<1.0	/ UJ	<1.0	/ UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/10/2017	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		4/16/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		10/9/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
M11[3]		***Upgradient***																												
	MW802	5/15/2008	<0.7		<0.7		<1.4		<1.4		3		<1.4		<0.7		<1.4		<1.4		<1.4		<0.7		<1.4		<0.7		<0.7	
		10/7/2008	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		10/7/2008 (DUP)	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		5/4/2009	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		10/27/2009	<0.24		<0.47		<0.47		<0.47		<0.47		<0.47		<0.24		<0.47		<0.47		<0.47		<0.24		<0.59		<0.24		<0.24	
		4/13/2010	<0.17		<0.33		<0.33		<0.33		<0.33		<0.33		<0.17		<0.33		<0.33		<0.33		<0.17		<0.42		<0.17		<0.17	
		10/28/2010	<0.34		<0.65		<0.65		<0.65		<0.65		<0.65		<0.34		<0.65		<0.65		<0.65		<0.34		<0.82		<0.34		<0.34	
		4/15/2011	<0.37		<0.72		<0.72		<0.72		<0.72		<0.72		<0.37		<0.72		<0.72		<0.72		<0.37		<0.91		<0.37		<0.37	
		10/11/2011	<0.17		<0.17		<0.17		<0.34		<0.34		<0.34		<0.17		<0.34		<0.34		<0.34		<0.17		<0.42		<0.17		<0.17	
		4/16/2012	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	U / UJ
		10/24/2012	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		10/16/2013	<0.39		<0.29		<0.19		<0.19		<0.19		<0.39		<0.39		<0.39		<0.39		<0.97		<0.19		<0.23		<0.97		<0.39	
		12/11/2014	<0.37		<0.37		<0.19		<0.19		<0.19		<0.37		<0.37		<0.37		<0.37		<0.93		<0.19		<0.22	U / UJ	<0.93		<0.37	
		10/28/2015	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		10/6/2016	<1.0		<0.30		<0.30		<1.0		<1.0		<1.0		<1.0		<1.0	/ UJ	<1.0	/ UJ	<1.0		<1.0		<1.0		<1.0		<1.0	
		10/9/2017	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		10/2/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
	MW803	10/7/2008	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		5/4/2009	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		10/27/2009	<0.20		<0.39		<0.39		<0.39		<0.39		<0.39		<0.20		<0.39		<0.39		<0.39		<0.20		<0.49		<0.20		<0.20	
		4/13/2010	<0.17		<0.32		<0.32		<0.32		<0.32		<0.32		<0.17		<0.32		<0.32		<0.32		<0.17		<0.40		<0.17		<0.17	
		10/28/2010	<0.33		<0.63		<0.63		<0.63		<0.63		<0.63		<0.33		<0.63		<0.63		<0.63		<0.33		<0.79		<0.33		<0.33	
		4/15/2011	<0.31		<0.59		<0.59		<0.59		<0.59		<0.59		<0.31		<0.59		<0.59		<0.59		<0.31		<0.75		<0.31		<0.31	
		10/11/2011	<0.18		<0.18		<0.18		<0.35		<0.35		<0.35		<0.18		<0.35		<0.35		<0.35		<0.18		<0.44		<0.18		<0.18	
		10/24/2012	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		10/16/2013	<0.38		<0.28		<0.19		<0.19		<0.19		<0.38		<0.38		<0.38		<0.38		<0.94		<0.19		<0.23		<0.94		<0.38	
		12/15/2014	<0.39		<0.39		<0.19		<0.19		<0.19		<0.39		<0.39		<0.39		<0.39		<0.97		<0.19		<0.23	U / UJ	<0.97		<0.39	
		10/28/2015	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		10/6/2016	<1.0		<0.30		<0.30		<1.0		<1.0		<1.0		<1.0		<1.0	/ UJ	<1.0	/ UJ	<1.0		<1.0		<1.0		<1.0		<1.0	
		10/9/2017	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		10/2/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	

TABLE B1

Summary of Analytical Results - Explosives
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	1,3-DNB	2,4-DNT	2,6-DNT	2-A-4,6-DNT	4-A-2,6-DNT	HMX	NB	2-NT	3-NT	4-NT	RDX	Tetryl	1,3,5-TNB	2,4,6-TNT
		Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
		Project Action Limit[1]	10	0.42	0.42	NS	NS	5100	51	5100	NS	NS	2.6	200	5.1	9.5
		Surface Water RG[2]	4	330	150	NS	NS	260	8000	62	NS	NS	500	NS	15	75
Site	Well	Date	Result LF/VF	Result LF/VF	Result LF/VF	Result LF/VF	Result LF/VF	Result LF/VF	Result LF/VF	Result LF/VF	Result LF/VF	Result LF/VF	Result LF/VF	Result LF/VF	Result LF/VF	Result LF/VF
		Downgradient														
M11[3]	MW333	5/12/2008	<0.39	<0.39	<0.78	<0.78	<0.78	<0.78	<0.39	<0.78	<0.78	<0.78	<0.39	<0.78	<0.39	<0.39
		10/6/2008	<0.39	<0.39	<0.78	<0.78	<0.78	<0.78	<0.39	<0.78	<0.78	<0.78	<0.39	<0.78	<0.39	<0.39
		5/5/2009	<0.16	<0.31	<0.31	<0.31	<0.31	<0.31	<0.16	<0.31	<0.31	<0.31	<0.16	<0.39	<0.16	<0.16
		10/28/2009	<0.21	<0.41	<0.41	<0.41	<0.41	<0.41	<0.21	<0.41	<0.41	<0.41	<0.21	<0.52	<0.21	<0.21
		4/13/2010	<0.17	<0.34	<0.34	<0.34	<0.34	<0.34	<0.17	<0.34	<0.34	<0.34	<0.17	<0.42	<0.17	<0.17
		10/28/2010	<0.30	<0.58	<0.58	<0.58	<0.58	<0.58	<0.30	<0.58	<0.58	<0.58	<0.30	<0.73	<0.30	<0.30
		4/18/2011	<0.18	<0.36	<0.36	<0.36	<0.36	<0.36 U / UJ	<0.18	<0.36	<0.36	<0.36	<0.18	<0.45	<0.18	<0.18
		10/11/2011	<0.17	<0.17	<0.17	<0.34	<0.34	<0.34	<0.17	<0.34	<0.34	<0.34	<0.17	<0.42	<0.17	<0.17
		10/24/2012	<0.16	<0.31	<0.31	<0.31	<0.31	<0.31	<0.16	<0.31	<0.31	<0.31	<0.16	<0.39	<0.16	<0.16
		10/16/2013	<0.37	<0.27	<0.18	<0.18	<0.18	<0.37	<0.37	<0.37	<0.37	<0.91	<0.18	<0.22	<0.91	<0.37
		12/15/2014	<0.38	<0.38	<0.19	<0.19	<0.19	<0.38	<0.38	<0.38	<0.38	<0.94	<0.19	<0.23 U / UJ	<0.94	<0.38
		10/28/2015	<1	<0.3	<0.3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
		10/6/2016	<1.0	<0.30	<0.30	<1.0	<1.0	<1.0	<1.0	<1.0 / UJ	<1.0 / UJ	<1.0	<1.0	<1.0	<1.0	<1.0
		10/9/2017	<1	<0.3	<0.3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
		10/2/2018	<1	<0.3	<0.3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	MW334	5/12/2008	<0.46	<0.46	<0.92	<0.92	<0.92	<0.92	<0.46	<0.92	<0.92	<0.92	<0.46	<0.92	<0.46	<0.46
		10/6/2008	<0.39	<0.39	<0.78	<0.78	<0.78	<0.78	<0.39	<0.78	<0.78	<0.78	<0.39	<0.78	<0.39	<0.39
		5/5/2009	<0.16	<0.31	<0.31	<0.31	<0.31	<0.31	<0.16	<0.31	<0.31	<0.31	<0.16	<0.39	<0.16	<0.16
		10/28/2009	<0.20	<0.39	<0.39	<0.39	<0.39	<0.39	<0.20	<0.39	<0.39	<0.39	<0.20	<0.49	<0.20	<0.20
		4/13/2010	<0.18	<0.34	<0.34	<0.34	<0.34	<0.34	<0.18	<0.34	<0.34	<0.34	<0.18	<0.43	<0.18	<0.18
		10/28/2010	<0.32	<0.63	<0.63	<0.63	<0.63	<0.63	<0.32	<0.63	<0.63	<0.63	<0.32	<0.79	<0.32	<0.32
		4/18/2011	<0.19	<0.37	<0.37	<0.37	<0.37	<0.37 U / UJ	<0.19	<0.37	<0.37	<0.37	<0.19	<0.47	<0.19	<0.19
		10/11/2011	<0.18	<0.18	<0.18	<0.36	<0.36	<0.36	<0.18	<0.36	<0.36	<0.36	0.15 F / J	<0.45	<0.18	<0.18
		10/11/2011 (DUP)	<0.26	<0.26	<0.26	<0.51	<0.51	<0.51	<0.26	<0.51	<0.51	<0.51	0.21 F / J	<0.64	<0.26	<0.26
		10/24/2012	<0.16	<0.31	<0.31	<0.31	<0.31	<0.31	<0.16	<0.31	<0.31	<0.31	<0.16	<0.39	<0.16	<0.16
		10/16/2013	<0.37	<0.28	<0.19	<0.19	<0.19	<0.37	<0.37	<0.37	<0.37	<0.93	<0.19	<0.22	<0.93	<0.37
		12/15/2014	<0.39	<0.39	<0.19	<0.19	<0.19	<0.39	<0.39	<0.39	<0.39	<0.97	<0.19	<0.23 U / UJ	<0.97	<0.39
		10/28/2015	<1	<0.3	<0.3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
		10/6/2016	<1.0	<0.30	<0.30	<1.0	<1.0	<1.0	<1.0	<1.0 / UJ	<1.0 / UJ	<1.0	<1.0	<1.0	<1.0	<1.0
		10/9/2017	<1	<0.3	<0.3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
		10/2/2018	<1	<0.3	<0.3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	MW335	5/13/2008	<0.39	<0.39	<0.78	<0.78	<0.78	<0.78	<0.39	<0.78	<0.78	<0.78	<0.39	<0.78	<0.39	<0.39
		10/7/2008	<0.39	<0.39	<0.78	<0.78	<0.78	<0.78	<0.39	<0.78	<0.78	<0.78	<0.39	<0.78	<0.39	<0.39
		10/7/2008 (DUP)	<0.39	<0.39	<0.78	<0.78	<0.78	<0.78	<0.39	<0.78	<0.78	<0.78	<0.39	<0.78	<0.39	<0.39
		5/4/2009	<0.16	<0.31	<0.31	<0.31	<0.31	<0.31	<0.16	<0.31	<0.31	<0.31	<0.16	<0.39	<0.16	<0.16
		10/28/2009	<0.29	<0.56	<0.56	<0.56	<0.56	<0.56	<0.29	<0.56	<0.56	<0.56	<0.29	<0.71	<0.29	<0.29
		4/13/2010	<0.25	<0.49	<0.49	<0.49	<0.49	<0.49	<0.25	<0.49	<0.49	<0.49	<0.25	<0.62	<0.25	<0.25
		4/13/2010 (DUP)	<0.18	<0.36	<0.36	<0.36	<0.36	<0.36	<0.18	<0.36	<0.36	<0.36	<0.18	<0.45	<0.18	<0.18
		10/28/2010	<0.24	<0.46	<0.46	<0.46	<0.46	<0.46	<0.24	<0.46	<0.46	<0.46	<0.24	<0.58	<0.24	<0.24
		4/15/2011	<0.19	<0.38	<0.38	<0.38	<0.38	<0.38	<0.19	<0.38	<0.38	<0.38	<0.19	<0.47	<0.19	<0.19
		10/12/2011	<0.24	<0.24	<0.24	<0.47	<0.47	<0.47	<0.24	<0.47	<0.47	<0.47	<0.24	<0.59	<0.24	<0.24 U / UJ
		4/16/2012	<0.16	<0.31	<0.31	<0.31	<0.31	<0.31	<0.16	<0.31	<0.31	<0.31	<0.16	<0.39	<0.16	<0.16 U / UJ
		10/24/2012	<0.16	<0.31	<0.31	<0.31	<0.31	<0.31	<0.16	<0.31	<0.31	<0.31	<0.16	<0.39	<0.16	<0.16
		10/16/2013	<0.38	<0.28	<0.19	<0.19	<0.19	<0.38	<0.38	<0.38	<0.38	<0.94	<0.19	<0.23	<0.94	<0.38
		10/16/2013 (DUP)	<0.37	<0.28	<0.19	<0.19	<0.19	<0.37	<0.37	<0.37	<0.37	<0.93	<0.19	<0.22	<0.93	<0.37
		12/11/2014	<0.38	<0.38	<0.19	<0.19	<0.19	<0.38	<0.38	<0.38	<0.38	<0.95	<0.19	<0.23 U / UJ	<0.95	<0.38
		12/11/2014 (DUP)	<0.38	<0.38	<0.19	<0.19	<0.19	<0.38	<0.38	<0.38	<0.38	<0.94	<0.19	<0.23 U / UJ	<0.94	<0.38
		10/28/2015	<1 / UJ	<0.3 / UJ	<0.3 / UJ	<1 / UJ	<1 / UJ	<1 / UJ	<1 / UJ	<1 / UJ	<1 / UJ	<1 / UJ	<1 / UJ	<1 / UJ	<1 / UJ	<1 / UJ
		10/6/2016	<1.0	<0.30	<0.30	<1.0	<1.0	<1.0	<1.0	<1.0 / UJ	<1.0 / UJ	<1.0	<1.0	<1.0	<1.0	<1.0
		10/6/2016 (DUP)	<1.0	<0.30	<0.30	<1.0	<1.0	<1.0	<1.0	<1.0 / UJ	<1.0 / UJ	<1.0	<1.0	<1.0	<1.0	<1.0
		10/9/2017	<1	<0.3	<0.3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
		10/2/2018	<1	<0.3	<0.3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
	MW336	5/13/2008	<0.39	<0.39	<0.78	<0.78	<0.78	<0.78	<0.39	<0.78	<0.78	<0.78	<0.39	<0.78	<0.39	<0.39
		10/7/2008	<0.39	<0.39	<0.78	<0.78	<0.78	<0.78	<0.39	<0.78	<0.78	<0.78	<0.39	<0.78	<0.39	<0.39
		5/5/2009	<0.16	<0.31	<0.31	<0.31	<0.31	<0.31	<0.16	<0.31	<0.31	<0.31	<0.16	<0.39	<0.16	<0.16
		5/5/2009 (DUP)	<0.16	<0.31	<0.31	<0.31	<0.31	<0.31	<0.16	<0.31	<0.31	<0.31	<0.16	<0.39	<0.16	<0.16
		10/27/2009	<0.21	<0.40	<0.40	<0.40	<0.40	<0.40	<0.21	<0.40	<0.40	<0.40	<0.21	<0.51	<0.21	<0.21
		10/27/2009 (DUP)	<0.21	<0.41	<0.41	<0.41	<0.41	<0.41	<0.21	<0.41	<0.41	<0.41	<0.21	<0.51	<0.21	<0.21
		4/13/2010	<0.24	<0.46	<0.46	<0.46	<0.46	<0.46	<0.24	<0.46	<0.46	<0.46	<0.24	<0.58	<0.24	<0.24
		10/28/2010	<0.30	<0.59	<0.59	<0.59	<0.59	<0.59	<0.30	<0.59	<0.59	<0.59	<0.30	<0.74	<0.30	<0.30
		4/18/2011	<0.19	<0.37	<0.37	<0.37	<0.37	<0.37 U / UJ	<0.19	<0.37	<0.37	<0.37	<0.19	<0.47	<0.19	<0.19
		10/12/2011	<0.18	<0.18	<0.18	<0.36	<0.36	<0.36	<0.18	<0.36	<0.36	<0.36	<0.18	<0.45	<0.18	<0.18 U / UJ
		4/16/2012	<0.16	<0.31	<0.31	<0.31	<0.31	<0.31	<0.16	<0.31	<0.31	<0.31	<0.16	<0.39	<0.16	<0.16 U / UJ
		10/24/2012	<0.16	<0.31	<0.31	<0.31	<0.31	<0.31	<0.16	<0.31 U / J	<0.31	<0.31	<0.16	<0.39	<0.16	<0.16
		10/24/2012 (DUP)	<0.16	<0.31	<0.31	<0.31	<0.31	<0.31	<0.16	<0.31	<0.31	<0.31	<0.16	<0.39	<0.16	<0.16
		10/16/2013	<0.38	<0.28	<0.19	<0.19	<0.19	<0.38	<0.38	<0.38	<0.38	<0.94	<0.19	<0.23	<0.94	<0.38
		12/11/2014	<0.42	<0.42	<0.21	<0.21	<0.21	<0.42	<0.42	<0.42	<0.42	<1.1	<0.21	<0.25 U / UJ	<1.1	<0.42
		10/28/2015	<1	<0.3	<0.3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
		10/6/2016	<1.0	<0.30	<0.30	<1.0	<1.0	<1.0	<1.0	<1.0 / UJ	<1.0 / UJ	<1.0	<1.0	<1.0	<1.0	<1.0
		10/9/2017	<1	<0.3	<0.3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
		10/2/2018	<1	<0.3	<0.3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

TABLE B1

Summary of Analytical Results - Explosives
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	**1,3-DNB**		**2,4-DNT**		**2,6-DNT**		**2-A-4,6-DNT**		**4-A-2,6-DNT**		**HMX**		**NB**		**2-NT**		**3-NT**		**4-NT**		**RDX**		**Tetryl**		**1,3,5-TNB**		**2,4,6-TNT**	
		Units	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
		Project Action Limit[1]	10		0.42		0.42		NS		NS		5100		51		5100		NS		NS		2.6		200		5.1		9.5	
		Surface Water RG[2]	4		330		150		NS		NS		260		8000		62		NS		NS		500		NS		15		75	
Site	**Well**	**Date**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**
		Downgradient																												
M11[3]	MW804	5/15/2008	<0.42		<0.42		<0.83		<0.83		<0.83		<0.83		<0.42		<0.83		<0.83		<0.83		<0.42		<0.83		<0.42		<0.42	
		10/6/2008	<0.46		<0.46		<0.92		1.6		4.7		<0.92		<0.46		<0.92		<0.92		<0.92		<0.46		<0.92		<0.46		0.52	
		5/5/2009	<0.16		<0.31		<0.31		0.81		2.6		0.8		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		0.57	
		10/27/2009	<0.24		<0.47		<0.47		0.73		2.3		0.79		<0.24		<0.47		<0.47		<0.47		0.22	F /	<0.59		<0.24		1.4	
		4/13/2010	<0.17		<0.33		<0.33		<0.33		0.88		<0.33		<0.17		<0.33		<0.33		<0.33		<0.17		<0.41		<0.17		<0.17	
		10/28/2010	<0.38		<0.74		<0.74		<0.74		<0.74		<0.74		<0.38		<0.74		<0.74		<0.74		<0.38		<0.93		<0.38		<0.38	
		4/15/2011	<0.45		<0.88		<0.88		0.52	F /	1.4		0.37	F /	<0.45		<0.88		<0.88		<0.88		0.26	F /	<1.1		<0.45		<0.45	
		4/15/2011 (DUP)	<0.32		<0.61		<0.61		0.51	F /	1.4		0.39	F /	<0.32		<0.61		<0.61		<0.61		<0.32		<0.77		<0.32		<0.32	
		10/11/2011	<0.16		<0.16		<0.16		0.37		1	/ J	0.68		<0.16		<0.31		<0.31		<0.31		0.22		<0.39		<0.16		<0.16	
		10/24/2012	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		10/16/2013	<0.37		<0.27		<0.18		<0.18		<0.18		<0.37		<0.37		<0.37		<0.37		<0.92		<0.18		<0.22		<0.92		<0.37	
		12/11/2014	<0.4		<0.4		<0.2		0.066	F / J	0.16	F / J	<0.4		<0.4		<0.4		<0.4		<1		<0.2		<0.24	U / UJ	<1		<0.4	
		10/28/2015	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		10/6/2016	<1.0		<0.30		<0.30		<1.0		<1.0		<1.0		<1.0		<1.0	/ UJ	<1.0	/ UJ	<1.0		<1.0		<1.0		<1.0		<1.0	
		10/9/2017	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		10/2/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
	MW805	10/6/2008	<0.39		<0.39		<0.78		<0.78		<0.78		<0.78		<0.39		<0.78		<0.78		<0.78		<0.39		<0.78		<0.39		<0.39	
		5/5/2009	<0.17		<0.32		<0.32		<0.32		<0.32		<0.32		<0.17		<0.32		<0.32		<0.32		<0.17		<0.40		<0.17		<0.17	
		10/27/2009	<0.16		<0.32		<0.32		<0.32		0.26	F /	<0.32		<0.16		<0.32		<0.32		<0.32		<0.16		<0.40		<0.16		<0.16	
		4/13/2010	<0.41		<0.79		<0.79		<0.79		<0.79		<0.79		<0.41		<0.79		<0.79		<0.79		<0.41		<0.99		<0.41		<0.41	
		11/2/2010	<0.27		<0.52		<0.52		<0.52		<0.52		<0.52		<0.27		<0.52		<0.52		<0.52		<0.27		<0.66		<0.27		<0.27	
		4/15/2011	<0.31		<0.59		<0.59		<0.59		<0.59		<0.59		<0.31		<0.59		<0.59		<0.59		<0.31		<0.75		<0.31		<0.31	
		10/11/2011	<0.16		<0.16		<0.16		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		4/16/2012	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	U / UJ
		10/24/2012	<0.16		<0.31		<0.31		<0.31		<0.31		<0.31		<0.16		<0.31		<0.31		<0.31		<0.16		<0.39		<0.16		<0.16	
		10/16/2013	<0.37	U / UJ	<0.28	U / UJ	<0.18		<0.18	U / UJ	<0.18	U / UJ	<0.37	U / UJ	<0.37		<0.37	U / UJ	<0.37		<0.92	U / UJ	<0.18	U / UJ	<0.22	U / UJ	<0.92	U / UJ	<0.37	U / UJ
		12/11/2014	<0.37		<0.37		<0.19		<0.19		<0.19		<0.37		<0.37		<0.37		<0.37		<0.93		<0.19		<0.22	U / UJ	<0.93		<0.37	
		10/28/2015	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		10/28/2015 (DUP)	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	
		10/6/2016	<1.0		<0.30		<0.30		<1.0		<1.0		<1.0		<1.0		<1.0	/ UJ	<1.0	/ UJ	<1.0		<1.0		<1.0		<1.0		<1.0	
		10/9/2017	<1		<0.3		<0.3		<1		<1		0.58	J /	<1		<1		<1		<1		<1		<1		<1		<1	
		10/2/2018	<1		<0.3		<0.3		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1		<1	

Notes:

Data since the sampling round conducted immediately prior to the completion of each individual site remedial action are shown.

µg/L = Micrograms per liter.
NS = No standard.
LF/VF = Lab flag/validation flag.
< = Result shows laboratory Method Reporting Limit for non-detected results.
DUP = Duplicate.
J = Estimated concentration.
F = Concentration below the reported detection limit.
U = Not detected.
UJ = Estimated detection limit.
JJ = Data is estimated due to more than one criteria.
B = Blank contamination.
Bolded result indicates Preventive Action Limit (RG) exceedance.

1,3-DNB = 1,3-Dinitrobenzene.
2,4-DNT = 2,4-Dinitrotoluene.
2,6-DNT = 2,6-Dinitrotoluene.
2-A-4,6-DNT = 2-amino-4,6-Dinitrotoluene.
4-A-2,6-DNT = 4-amino-2,6-Dinitrotoluene.
HMX = High melting-point explosive.
NB = Nitrobenzene.
2-NT = 2-Nitrotoluene.
3-NT = 3-Nitrotoluene.
4-NT = 4-Nitrotoluene.
RDX = Royal Demolition Explosive.
1,3,5-TNB = 1,3,5-Trinitrobenzene.
2,4,6-TNT = 2,4,6-Trinitrotoluene.

Footnotes:

(1) Project Action Limits are the Remedial Goals (RGs) as specified in Table 6-2 of the 1998 Record of Decision. Where no RG is presented in the 1998 Record of Decision, the Project Action Limit is obtained from Illinois Environmental Protection Agency Class II groundwater standards.
(2) The surface water Project Action Limits are obtained from Table 10-1 of the 1998 Record of Decision.
(3) Sites L2, L14, and M11 sampled only during the Annual round.

B2 - SUMMARY OF HISTORICAL GROUNDWATER RESULTS – METALS

TABLE B2

Summary of Analytical Results - Metals
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Analyte	Aluminum		Antimony		Arsenic		Barium		Beryllium		Cadmium		Chromium		Cobalt		Copper		Iron		Lead		Manganese		Mercury		Nickel		Selenium		Silver		Thallium		Vanadium		Zinc	
		Units	mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
		Project Action Limit[1]	100		0.024		0.2		NS		NS		0.05		1.0		NS		NS		5.0		0.1		10		NS		NS		NS		0.511		NS		NS		10	
Site	Well	Date	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF
		Upgradient																																						
M13	MW806	5/15/2008	<0.2		<0.02		<0.01		0.095		<0.004		<0.002		<0.01		<0.005		<0.01		<0.15		<0.005		0.053		<0.0002		<0.01		<0.01		<0.005		<0.01		<0.005		0.013	F /
		8/19/2008	<0.2		<0.02		<0.01		0.093		<0.004		<0.002		<0.01		<0.005		0.0012	F /	0.058	F /	<0.005		0.051		<0.0002		<0.01		<0.01		<0.005		<0.01		0.002	F /	0.0047	F /
		10/21/2008	0.016	F /	<0.02		<0.01		0.1		<0.004		<0.002		<0.01		<0.005		<0.01		0.61		0.0032	F /	0.038		<0.0002		<0.01		<0.01		<0.005		<0.01		0.0043	F /	0.024	
		2/4/2009	<0.20		<0.020		<0.010		0.094		<0.0040		<0.0020		<0.010		<0.0050		<0.010		<0.10		<0.0050		0.013		<0.0002		<0.010		<0.010		<0.0050		<0.010		0.0041	F /	<0.020	F / U
		5/5/2009	<0.20		<0.020		<0.010		0.099		<0.0040		<0.0020		<0.010		<0.0050		<0.010		<0.10		<0.0050		<0.010		<0.0002		<0.010		<0.010		<0.0050		<0.010		<0.0050		<0.020	
		7/29/2009	<0.2		0.0027	F /	<0.01		0.091		<0.004		<0.002		<0.01		0.0018	F /	<0.01		0.12		0.0058	/ U	0.077		<0.0002		<0.01		<0.01		<0.005		<0.01		0.0032	F /	<0.02	
		10/28/2009	<0.20		<0.020		<0.010		0.093		<0.0040		<0.0020		<0.010		<0.0050		<0.010		0.26		<0.0050		0.03		<0.0002		<0.010		<0.010		<0.0050		<0.010		0.0024	F /	<0.020	
		1/15/2010	<0.20		<0.020		<0.010		0.093		<0.0040		<0.0020		<0.010		0.0043	F /	<0.010		<0.10		<0.0050		0.0061	F /	<0.0002		0.0014	F /	<0.010		<0.0050		<0.010		0.0035	F /	<0.020	
		4/14/2010	<0.20		<0.020		<0.010		0.098		<0.0040		<0.0020		<0.010		<0.0050		0.001	F /	<0.20		<0.0050		0.00057	F /	<0.0002		<0.010		<0.010		<0.0050		<0.010		0.0036	F /	<0.020	
		7/21/2010	<0.20		<0.020		<0.010		0.092		<0.0040		<0.0020		<0.010		<0.0050		<0.010		0.11	F / U	<0.0050		0.06		<0.0002		<0.010		<0.010		<0.0050		<0.010		0.003	F /	0.005	F / U
		10/28/2010	<0.20		<0.020		<0.010		0.099		<0.0040		0.00045	F / U	<0.010		<0.0050		<0.010		0.79		<0.0050		0.021		<0.0002		<0.010		<0.010		<0.0050		<0.010		<0.0050		0.0035	F /
		1/27/2011	0.083	F /	<0.020		<0.010		0.085		<0.0040		<0.0020		<0.010		<0.0050		0.0015	F /	<0.20		<0.0050		0.0073	F /	<0.0002		<0.010		<0.010		<0.0050		<0.010		0.0019	F /	0.036	
		4/19/2011	<0.20		0.0029	F /	<0.010		0.095		<0.0040		0.001	F / U	<0.010		<0.0050		<0.010		<0.20		<0.0050		0.001	F /	<0.0002		<0.010		<0.010		<0.0050		<0.010		<0.0050		0.011	F /
		7/28/2011	<0.20		<0.020		<0.010		0.096		<0.0040		0.00069	F / U	<0.010		<0.0050		<0.010		0.27		<0.0050		0.063		<0.0002		<0.010		<0.010		<0.0050		<0.010		<0.0050		<0.020	
		10/12/2011	<0.20		<0.020		<0.010		0.091		<0.0040		0.00098	F /	<0.010		<0.0050		<0.010		0.68		<0.0050		0.032		<0.0002		<0.010		<0.010		<0.0050		<0.010		<0.0050		<0.020	
		2/29/2012	<0.20		<0.020		<0.010		0.096		<0.0040		<0.0020		0.00096	F /	<0.0050		<0.010		<0.20		<0.0050		0.0017	F /	<0.20		<0.010		<0.010		<0.0050		<0.010		0.0031	F /	<0.020	
		4/16/2012	<0.20		<0.020		<0.010		0.082		<0.0040		0.00068	F /	<0.010		<0.0050		<0.010		<0.20		<0.0050		0.0024	F /	<0.20	U / UJ	<0.010		<0.010		<0.0050		<0.010		<0.0050		0.013	F /
		7/17/2012	<0.2		<0.02		<0.01		0.1		<0.004		0.00078	F /	<0.01		<0.005		0.0014	F /	0.65		<0.005		0.025			U / R	<0.01		<0.01		<0.005		<0.01		<0.005		<0.02	
		10/24/2012	<0.2		<0.02		<0.01		0.097		<0.004		0.00097	F /	<0.01		<0.005		0.0013	F /	0.089	F /	<0.005		0.021		<0.2		<0.01		<0.01		<0.005		<0.01		<0.005		<0.02	
		1/31/2013	<0.3		<0.02		<0.025		0.095		<0.0015		0.00073	F /	<0.015		<0.015		<0.015		0.15		<0.015		0.0069	F /	<0.0002		<0.04		<0.022		<0.015		<0.04		<0.015		<0.15	
		1/31/2013 (DUP)	<0.3		0.0039	F /	<0.025		0.098		<0.0015		0.00073	F /	<0.015		<0.015		<0.015		0.16		<0.015		0.0069	F /	<0.0002		<0.04		<0.022		<0.015		<0.04		<0.015		<0.15	
		4/9/2013	<0.3		<0.02		<0.025		0.096		<0.0015		0.0006	F /	<0.015		<0.015		0.0027	F /	0.022	F /	<0.015		0.0046	F /	<0.0002		<0.04		<0.022		<0.015		<0.04		0.0011	F /	<0.15	
		7/31/2013	<0.3		<0.02		<0.025		0.093		<0.0015		0.00067	F /	<0.015		<0.015		<0.015		<0.1		<0.015		0.025		<0.2		<0.04		<0.022		<0.005		<0.04		<0.015		<0.15	
		10/15/2013	<0.3		<0.02		<0.025		0.095		<0.0015		<0.002		<0.015		<0.015		<0.015		0.26		<0.015		0.039		<0.2		<0.04		<0.022		<0.005		<0.04		<0.015		<0.15	
		10/21/2014	<0.3		<0.02		0.0059	F / B	0.1		<0.0015		<0.005		<0.015		<0.015		0.0016	F /	0.36		<0.015		0.045		<0.0002		0.0015	F /	<0.022		<0.015		<0.04		<0.015		<0.15	
		11/19/2014	<0.3		0.0033	F /	<0.025		0.094		<0.0015		<0.005		<0.015		<0.015		<0.015		<0.1		<0.015		0.0091	F /	<0.0002		<0.04		<0.022		0.0013	F / B	<0.04		<0.015		<0.15	
		12/16/2014	<0.3		<0.02		<0.025		0.1		<0.0015		<0.005		<0.015		<0.015		<0.015		<0.1		<0.015		0.0098	F /	<0.0002		<0.04		0.0073	F / B	<0.015		<0.04		<0.015		<0.15	
		8/19/2015	<0.40		<0.020		<0.015		0.091		<0.0050		0.0006	/ U	<0.010		<0.025		<0.010		0.086	J	<0.010		0.05		<0.00020		<0.040		<0.020		<0.010		<0.050		<0.050		<0.020	
		10/26/2015	<0.4		<0.02		<0.015		0.092		<0.005		<0.005		<0.01		<0.025		<0.01		<0.1		<0.01		0.014	J /	<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
		4/25/2016	< 0.40		< 0.020		< 0.015		0.095		< 0.0050		< 0.0050		0.00094	J/	< 0.025		0.0024	J /	< 0.10		< 0.010		< 0.015		< 0.00020		< 0.040		< 0.020		< 0.010		< 0.050		< 0.050		< 0.020	
		10/5/2016	<0.40		<0.020		<0.015		0.1		<0.0050		<0.0050		<0.010		<0.025		<0.010		0.94		<0.010		0.031		<0.00020		<0.040		<0.020		<0.010		<0.050		<0.050		<0.020	
		4/24/2017	<0.40		<0.020		0.0034	BJ / UB	0.093		0.00038	J /	<0.0050		0.0053	J /	<0.025		<0.010		<0.10		0.008	J / UB	0.001	J /	<0.00020		<0.040		<0.020		<0.010		<0.050		<0.050		<0.020	
		10/10/2017	<0.4		<0.02		0.0031	BJ /	0.11		<0.005		<0.005		<0.01		<0.025		<0.01		1.6		<0.01		0.025		<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
		4/16/2018	<0.4		<0.02		0.0026	J /	0.092		<0.005		<0.005		<0.01		<0.025		<0.01		<0.1		<0.01		<0.015		<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
		10/9/2018	<0.8		<0.04		<0.03		0.11		<0.01		0.0014	J /	<0.02		<0.05		<0.02		1		<0.02		0.029	J /	<0.0002		<0.08		<0.04		<0.02		<0.1		<0.1		<0.04	
	MW807	5/15/2008	0.02	F /	<0.02		<0.01		0.094		<0.004		<0.002		<0.01		0.0024	F /	<0.01		0.69		<0.005		0.14		<0.0002		0.0056	F /	<0.01		<0.005		<0.01		0.0017	F /	0.11	
		5/15/2008 (DUP)	0.018	F /	<0.02		<0.01		0.089		<0.004		<0.002		<0.01		0.0017	F /	<0.01		0.55		<0.005		0.13		<0.0002		0.0045	F /	<0.01		<0.005		<0.01		0.0019	F /	0.1	
		8/19/2008	<0.2		<0.02		<0.01		0.023		<0.004		<0.002		<0.01		<0.005		0.0036	F /	<0.15		<0.005		<0.01		<0.0002		0.0051	F /	<0.01		<0.005		<0.01		0.0017	F /	0.013	F /
		8/19/2008 (DUP)	<0.2		<0.02		<0.01		0.021		<0.004		<0.002		<0.01		<0.005		0.0024	F /	<0.15		<0.005		0.0029	F /	<0.0002		0.0038	F /	<0.01		<0.005		<0.01		<0.005		0.011	F /
		10/21/2008	<0.2		<0.02		<0.01		0.1		<0.004		<0.002		<0.01		0.0014	F /	<0.01		0.77		<0.005		0.11		<0.0002		0.0031	F /	<0.01		<0.005		<0.01		0.0062		0.019	F /
		2/4/2009	0.018	F /	<0.020		<0.010		0.096		<0.0040		<0.0020		<0.010		0.0013	F /	<0.010		1.3		<0.0050		0.079		<0.0002		<0.010		<0.010		<0.0050		<0.010		0.0049	F /	<0.020	
		5/5/2009	<0.20		<0.020		<0.010		0.095		<0.0040		<0.0020		<0.010		0.00053	F /	<0.010		1.1		<0.0050		0.083		<0.0002		<0.010		<0.010		<0.0050		<0.010		<0.0050		<0.020	
		7/29/2009	<0.2		0.0028	F /	<0.01		0.097		<0.004		<0.002		<0.01		0.0012	F /	<0.01		1.1		<0.005		0.096		<0.0002		0.0021	F /	<0.01		<0.005		<0.01		0.0041	F /	<0.02	
		10/28/2009	<0.20		<0.020		<0.010		0.11		<0.0040		<0.0020		<0.010		0.00044	F /	<0.010		1		<0.0050		0.097		<0.0002		0.002	F /	<0.010		<0.0050		<0.010		0.004	F /	0.018	F / U
		1/15/2010	<0.20		<0.020		<0.010		0.095		<0.0040		<0.0020		<0.010		0.0034	F /	<0.010		1.3		<0.0050		0.079		<0.0002		0.0021	F /	<0.010		<0.0050		<0.010		0.0046	F /	<0.020	
		4/14/2010	<0.20		<0.020		<0.010		0.1		<0.0040		<0.0020		<0.010		<0.0050		<0.010		1.3		<0.0050		0.08		<0.0002		<0.010		<0.010		<0.0050		<0.010		0.004	F /	<0.020	
		7/21/2010	<0.20		<0.020		<0.010		0.094		<0.0040		<0.0020		<0.010		<0.0050		<0.010		0.98		<0.0050		0.096		<0.0002		0.0021	F /	<0.010		<0.0050		<0.010		0.0034	F /	0.0036	F / U
		10/28/2010	<0.20		0.0039	F /	<0.010		0.087		<0.0040		0.00084	F / U	<0.010		<0.0050		0.0016	F /	1.1		<0.0050		0.069		<0.0002		<0.010		<0.010		<0.0050		<0.010		<0.0050		<0.020	
		1/27/2011	<0.20		<0.020		<0.010		0.085		<0.0040		<0.0020		<0.010		<0.0050		<0.010		1.1		<0.0050		0.068		<0.0002		<0.010		<0.010		<0.0050		<0.010		0.0033	F /	<0.020	
		4/19/2011	<0.20		0.0097	F /	<0.010		0.09		0.00068	F /	0.0011	F / U	0.0022	F /	<0.0050		0.0032	F /	0.91		0.0037	F /	0.1		<0.0002		<0.010		<0.010		<0.0050		<0.010		0.0022	F /	0.017	F /
		7/28/2011	<0.20		<0.020		<0.010		0.093		<0.0040		0.001	F / U	<0.010		<0.0050		<0.010		1		<0.0050		0.086		<0.0002		0.0016	F /	0.0027	F / U	<0.0050		<0.010		<0.0050		<0.020	
		10/12/2011	<0.20		0.0032	F /	<0.010		0.089		<0.0040		0.00099	F /	<0.010		<0.0050		0.0029	F /	0.81		<0.0050		0.097		<0.0002		<0.010		0.0036	F /	<0.0050		<0.010		<0.0050		<0.020	
		2/29/2012	0.026	F /	0.003	F / U	<0.010		0.097		<0.0040		<0.0020		<0.010		<0.0050		<0.010		0.82		0.0017	F / U	0.092		<0.20		0.0021	F /	<0.010		<0.0050		<0.010		0.004	F /	<0.020	
		4/16/2012	<0.20		<0.020		<0.010		0.088		<0.0040		0.00098	F /	<0.010		<0.0050		<0.010		0.59		<0.0050		0.11		<0.20	U / UJ	0.0025	F /	<0.010		<0.0050		<0.010		<0.0050		0.0095	F /
		7/17/2012	<0.2		0.0031	F /	<0.01		0.095		<0.004		0.0012	F /	<0.01		<0.005		0.0022	F /	0.2		<0.005		0.15			U / R	0.0025	F /	<0.01		<0.005		<0.01		<0.005		<0.02	
		10/24/2012	<0.2		0.0033	F /	<0.01		0.094		<0.004		0.0009	F /	<0.01		<0.005		0.0014	F /	0.5		<0.005		0.12		<0.2		0.0021	F /	<0.01		<0.005		<0.01		<0.005		<0.02	
		1/31/2013	<0.3		<0.02		<0.025		0.093		<0.0015		0.00092	F /	<0.015		<0.015		<0.015		0.41		<0.015		0.13		<0.0002		0.0031	F /	<0.022		<0.015		<0.04		0.0012	F /	<0.15	
		4/9/2013	<0.3		<0.02		<0.025		0.096		<0.0015		0.00078	F /	<0.015		<0.015		<0.015		0.34		<0.015		0.14		<0.0002		0.0033	F /	<0.022		<0.015		<0.04		0.0016	F /	<0.15	
		7/31/2013	<0.3		0.0037	F /	<0.025		0.086		<0.0015		0.00078	F /	<0.015		<0.015		<0.015		0.76		<0.015		0.087		<0.2		0.0014	F /	<0.022		<0.005		<0.04		<0.015		<0.15	
		10/15/2013	<0.3		<0.02		<0.025		0.094		<0.0015		0.00078	F /	<0.015		<0.015		<0.015		0.36		<0.015		0.14		<0.2		0.0021	F /	<0.022		<0.005		<0.04		<0.015		<0.15	
		10/21/2014	<0.3		<0.02		<0.025		0.12		<0.0015		<0.005		<0.015		0.0012	F /	0.0034	F /	0.75		<0.015		0.16		<0.0002		0.004	F /	<0.022		<0.015		<0.04		0.0017	F /	<0.15	
		11/19/2014	<0.3	U / UJ	<0.02		<0.025		0.12		<0.0015	U / UJ	<0.005		<0.015		<0.015		0.002	F /	0.64		<0.015		0.15	/ J	<0.0002		0.0035	F /	<0.022		0.001	F / B	<0.04	U / UJ	0.0014	F /	0.0051	F / J
		12/16/2014	<0.3		0.0032	F /	0.012	F / B	0.12		<0.0015		0.00061	F /	<0.015		<0.015		0.0016	F /	0.79		<0.015		0.14		<0.0002		0.0032	F /	<0.022		<0.015		<0.04		<0.015		<0.15	
		8/19/2015	<0.40		<0.020		<0.015		0.12		<0.0050		0.0006	/ U	<0.010		<0.025		<0.010		0.62		<0.010		0.16		<0.00020		<0.040		<0.020		<0.010		<0.050		<0.050		<0.020	
		10/26/2015	<0.4		<0.02		0.0027	J /	0.11		<0.005		<0.005		<0.02		<0.025		<0.01		0.76		<0.01		0.15		<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
		4/25/2016	< 0.40		< 0.020		< 0.015		0.12		0.00027	J /U	< 0.0050		0.00098	J /	< 0.025		0.0066	J/	0.76		< 0.010		0.14		0.000078	J /	< 0.040		< 0.020		< 0.010		< 0.050		< 0.050		< 0.020	
		10/5/2016	<0.40		<0.020		<0.015		0.12		0.00022	J /	<0.0050		<0.010		<0.025		<0.010		0.67		<0.010		0.15		<0.00020		<0.040		<0.020		<0.010		<0.050		<0.050		<0.020	
		4/24/2017	<0.40		<0.020		0.0048	BJ / UB	0.11		0.00089	J /	0.0007	J /	0.0013	J /	<0.025		<0.010		0.96		<0.010		0.095		<0.00020		<0.040		<0.020		<0.010		<0.050		<0.050		<0.020	
		10/10/2017	<0.4		<0.02		<0.015		0.12		<0.005		<0.005		<0.01		<0.025		<0.01		0.79		<0.01		0.12		<0.0002		0.0078	J /	<0.02		<0.01		0.0092	J / U	<0.05		<0.02	
		4/16/2018	<0.4		<0.02		<0.015		0.11		<0.005		0.0006	J /	<0.01		<0.025		<0.01		0.84		<0.01		0.12		<0.0002		0.0053	J /	<0.02		<0.01		<0.05		<0.05		<0.02	
		10/9/2018	<0.4		<0.02		<0.015		0.093		<0.005		0.0008	J /	<0.01		<0.025		<0.01		0.46		<0.01		0.11		<0.0002		<0.04		<0.02		<0.01		<0.05		0.0094	J /	<0.02	

TABLE B2

Summary of Analytical Results - Metals
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Analyte	Aluminum		Antimony		Arsenic		Barium		Beryllium		Cadmium		Chromium		Cobalt		Copper		Iron		Lead		Manganese		Mercury		Nickel		Selenium		Silver		Thallium		Vanadium		Zinc	
		Units	mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
		Project Action Limit[1]	100		0.024		0.2		NS		NS		0.05		1.0		NS		NS		5.0		0.1		10		NS		NS		NS		0.511		NS		NS		10	
Site	Well	Date	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF
		Downgradient																																						
	MW126R	5/20/2008	<0.2		0.0052	F /	<0.01		0.058		0.00021	F /	<0.002		<0.01		<0.005		0.0024	F /	<0.15		0.0018	F /	0.0041	F /	<0.0002		<0.01		<0.01		<0.005		<0.01		<0.005		0.011	F /
		8/20/2008	<0.2		<0.02		<0.01		<0.01		<0.004		<0.002		<0.01		<0.005		0.0012	F /	<0.15		<0.005		<0.01		<0.0002		<0.01		<0.01		<0.005		<0.01		<0.005		0.0042	F /
		10/22/2008	0.02	F /	<0.02		<0.01		0.00087	F /	<0.004		<0.002		<0.01		<0.005		0.0049	F /	0.039	F /	0.0028	F /	<0.01		<0.0002		<0.01		<0.01		<0.005		<0.01		<0.005		0.0058	F /
		2/5/2009	<0.20		<0.020		<0.010		0.055		<0.0040		<0.0020		<0.010		<0.0050		<0.010		<0.10	F / U	<0.0050		0.0089	F /	<0.0002		<0.010		<0.010		<0.0050		<0.010		0.0033	F /	<0.020	F / U
		5/5/2009	<0.20		<0.020		<0.010		0.056		<0.0040		<0.0020		<0.010		<0.0050		<0.010		<0.10		<0.0050		0.0069	F /	<0.0002		<0.010		<0.010		<0.0050		<0.010		<0.0050		<0.020	
		7/28/2009	<0.20		<0.020		<0.010		0.058		<0.0040		<0.0020		<0.010		<0.0050		<0.010		0.18		<0.0050		0.022		<0.0002		<0.010		<0.010		<0.0050		<0.010		0.0024	F /	<0.020	
		10/29/2009	<0.20		<0.020		<0.010		0.066		<0.0040		<0.0020		<0.010		<0.0050		<0.010		0.052	F /	<0.0050		0.03		<0.0002		<0.010		<0.010		<0.0050		<0.010		0.003	F /	<0.020	
		1/14/2010	<0.20		0.0039	F / U	<0.010		0.13		<0.0040		<0.0020		<0.010		0.0026	F / U	<0.010		<0.10		<0.0050		0.022		<0.0002		0.0022	F /	<0.010		<0.0050		<0.010		0.0041	F /	<0.020	
		4/14/2010	<0.20		<0.020		<0.010		0.099		<0.0040		<0.0020		<0.010		<0.0050		<0.010		<0.20		<0.0050		0.00056	F /	<0.0002		<0.010		<0.010		<0.0050		<0.010		0.0032	F /	<0.020	
		4/14/2010 (DUP)	<0.20		<0.020		<0.010		0.098		<0.0040		<0.0020		<0.010		<0.0050		0.0013	F /	<0.20		<0.0050		<0.010		<0.0002		<0.010		<0.010		<0.0050		<0.010		0.0025	F /	<0.020	
		7/20/2010	<0.20		<0.020		<0.010		0.064		<0.0040		<0.0020		0.0015	F /	<0.0050		<0.010		0.091	F / U	<0.0050		0.03		<0.0002		0.0018	F /	<0.010		0.0009	F /	<0.010		0.0027	F /	0.0068	F / U
		10/28/2010	<0.20		<0.020		<0.010		0.086		<0.0040		0.00066	F / U	<0.010		<0.0050		0.0032	F /	<0.20		<0.0050		0.015		<0.0002		<0.010		<0.010		<0.0050		<0.010		<0.0050		0.0051	F /
		1/28/2011	<0.20		<0.020		<0.010		0.069		<0.0040		<0.0020		<0.010		<0.0050		<0.010		<0.20		<0.0050		0.0058	F /	<0.0002		<0.010		<0.010		<0.0050		<0.010		0.0021	F /	<0.020	
		4/19/2011	<0.20		<0.020		<0.010		0.062		<0.0040		0.00099	F / U	<0.010		<0.0050		0.0014	F /	<0.20		<0.0050		0.0027	F /	<0.0002		<0.010		<0.010		<0.0050		<0.010		<0.0050		0.021	
		7/28/2011	<0.20		0.0034	F /	<0.010		0.058		<0.0040		0.00089	F / U	<0.010		<0.0050		<0.010		0.14	F /	<0.0050		0.025		<0.0002		<0.010		<0.010		<0.0050		<0.010		<0.0050		<0.020	
		10/13/2011	<0.20		<0.020		<0.010		0.057		<0.0040		0.00091	F /	<0.010		<0.0050		0.064		0.19	F /	<0.0050		0.027		<0.0002		<0.010		<0.010		<0.0050		<0.010		<0.0050		0.04	
		2/29/2012	<0.20		<0.020		<0.010		0.055		<0.0040		<0.0020		<0.010		<0.0050		<0.010		<0.20		0.0016	F / U	0.0088	F /	<0.20		<0.010		<0.010		<0.0050		<0.010		0.0029	F /	<0.020	
		4/16/2012	<0.20		<0.020		<0.010		0.048		<0.0040		0.00078	F /	<0.010		<0.0050		<0.010		<0.20		<0.0050		0.0032	F /	<0.20	U / UJ	0.0022	F /	<0.010		<0.0050		<0.010		<0.0050		0.009	F /
		7/17/2012	<0.2		<0.02		<0.01		0.054		<0.004		0.00079	F /	<0.01		<0.005		0.0014	F /	0.12	F /	<0.005		0.019			U / R	<0.01		<0.01		<0.005		<0.01		<0.005		<0.02	
		10/25/2012	<0.2		0.0036	F / U	<0.01		0.058		<0.004		<0.002		0.0011	F / U	<0.005		<0.01		0.88		<0.005		0.023		<0.2		<0.01		<0.01		<0.005		<0.01		0.004	F /	<0.02	
		1/30/2013	<0.3		<0.02		<0.025		0.058		<0.0015		<0.005		<0.015		<0.015		0.0017	F /	<0.1		<0.015		0.022		<0.0002		0.0018	F /	<0.022		<0.015		0.012	F / B	<0.015		0.0066	F /
		4/9/2013	<0.3		<0.02		<0.025		0.053		<0.0015		0.00054	F /	<0.015		<0.015		<0.015		0.045	F /	<0.015		0.02		<0.0002		<0.04		<0.022		<0.015		<0.04		<0.015		<0.15	
		7/31/2013	<0.3		<0.02		<0.025		0.053		<0.0015		0.00046	F /	<0.015		<0.015		<0.015		<0.1		<0.015		0.0035	F /	<0.2		<0.04		<0.022		<0.005		<0.04		<0.015		<0.15	
		10/15/2013	<0.3		<0.02		<0.025		0.055		<0.0015		0.00049	F /	<0.015		<0.015		<0.015		0.17		<0.015		0.025		<0.2		<0.04		<0.022		<0.005		<0.04		<0.015		<0.15	
		10/21/2014	<0.3		<0.02		<0.025		0.06		<0.0015		<0.005		<0.015		<0.015		0.0019	F /	0.14		<0.015		0.035		<0.0002		0.0015	F /	<0.022		<0.015		<0.04		0.0012	F /	<0.15	
		11/19/2014	<0.3		<0.02		<0.025		0.063		<0.0015		<0.005		<0.015		<0.015		0.0042	F /	<0.1		<0.015		0.0019	F /	<0.0002		0.0014	F /	<0.022		0.0014	F / B	<0.04		<0.015		0.0059	F /
		12/16/2014	<0.3		<0.02		<0.025		0.059		<0.0015		<0.005		<0.015		<0.015		<0.015		0.038	F /	0.0027	F /	0.014		<0.0002		0.0015	F /	<0.022		<0.015		<0.04		<0.015		<0.15	
		8/20/2015	<0.40		<0.020		<0.015		0.13		<0.0050		0.0006	/ U	<0.010		<0.025		<0.010		<0.10		<0.010		0.0055	/ U	<0.00020		<0.040		<0.020	/ UJ	<0.010		<0.050		<0.050		<0.020	
		10/26/2015	<0.4		<0.02		<0.015		0.073		<0.005		<0.005		<0.01		<0.025		0.0039	J / J	<0.1		<0.01		0.0098	J /	<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
		4/25/2016	< 0.40		< 0.020		< 0.015		0.072		< 0.0050		< 0.0050		< 0.010		< 0.025		0.0028	J /	< 0.10		< 0.010		0.0011	J/	0.000077	J /	< 0.040		< 0.020		< 0.010		< 0.050		< 0.050		< 0.020	
		10/5/2016	<0.40		<0.020		<0.015		0.069		<0.0050		<0.0050		<0.010		<0.025		<0.010		<0.10		<0.010		0.051		<0.00020		<0.040		<0.020		<0.010		<0.050		<0.050		<0.020	
		4/24/2017	<0.40		<0.020		0.0043	BJ / UB	0.062		0.00045	J /	<0.0050		<0.010		<0.025		<0.010		<0.10		0.0078	J / UB	0.0045	J /	<0.00020		<0.040		<0.020		<0.010		0.0056	J / UB	<0.050		<0.020	
		10/10/2017	<0.4		<0.02		<0.015		0.065		<0.005		<0.005		<0.01		<0.025		<0.01		<0.1		<0.01		0.016		<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
		4/16/2018	<0.4		<0.02		<0.015		0.15		<0.005		<0.005		<0.01		<0.025		<0.01		<0.1		<0.01		0.0022	J /	<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
		10/9/2018	<0.4		<0.02		0.0036	J /	0.079		<0.005		<0.005		<0.01		<0.025		<0.01		<0.1		<0.01		0.02		<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
		10/9/2018 (DUP)	<0.4		<0.02		0.0046	J /	0.082		<0.005		<0.005		<0.01		<0.025		<0.01		<0.1		<0.01		0.02		<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
	M13	5/13/2008	0.032	F /	<0.02		<0.01		0.045		<0.004		<0.002		<0.01		<0.005		<0.01		<0.15		<0.005		0.041		<0.0002		<0.01		<0.01		<0.005		<0.01		0.0012	F /	0.046	
		8/20/2008	<0.2		<0.02		<0.01		<0.01		<0.004		<0.002		<0.01		<0.005		<0.01		<0.15		<0.005		<0.01		<0.0002		<0.01		<0.01		<0.005		<0.01		<0.005		0.0049	F /
		10/22/2008	<0.2		<0.02		<0.01		0.046		<0.004		<0.002		<0.01		0.0013	F /	<0.01		<0.15		<0.005		0.11		<0.0002		0.0049	F /	<0.01		<0.005		<0.01		0.0056		0.016	F /
		2/5/2009	0.017	F /	<0.020		<0.010		0.048		<0.0040		<0.0020		<0.010		0.0014	F /	<0.010		<0.10	F / U	<0.0050		0.17		<0.0002		0.0037	F /	<0.010		<0.0050		<0.010		0.0056		<0.020	F / U
		5/5/2009	<0.20		<0.020		<0.010		0.041		<0.0040		<0.0020		<0.010		<0.0050		<0.010		<0.10		<0.0050		0.016		<0.0002		<0.010		<0.010		<0.0050		<0.010		<0.0050		<0.020	
		7/28/2009	<0.20		<0.020		<0.010		0.043		<0.0040		<0.0020		<0.010		0.0025	F /	<0.010		<0.10		<0.0050		0.059		<0.0002		0.0033	F /	<0.010		<0.0050		<0.010		0.0045	F /	<0.020	
		10/29/2009	<0.20		<0.020		<0.010		0.048		<0.0040		<0.0020		<0.010		0.0008	F /	<0.010		<0.10		<0.0050		0.17		<0.0002		0.0042	F /	<0.010		<0.0050		<0.010		0.0037	F /	<0.020	
		1/14/2010	<0.20		<0.020		<0.010		0.048		<0.0040		<0.0020		<0.010		0.00098	F / U	<0.010		<0.10		<0.0050		0.18		<0.0002		0.0046	F /	<0.010		<0.0050		<0.010		0.004	F /	<0.020	
		1/14/2010 (DUP)	<0.20		<0.020		<0.010		0.048		<0.0040		<0.0020		<0.010		0.004	F /	<0.010		<0.10		<0.0050		0.18		<0.0002		0.005	F /	<0.010		<0.0050		<0.010		0.0044	F /	<0.020	
		4/14/2010	<0.20		<0.020		<0.010		0.051		<0.0040		<0.0020		<0.010		<0.0050		<0.010		<0.20		<0.0050		0.088		<0.0002		0.0036	F /	<0.010		<0.0050		<0.010		0.0045	F /	<0.020	
		7/20/2010	<0.20		<0.020		<0.010		0.049		<0.0040		<0.0020		<0.010		<0.0050		<0.010		0.17	F / U	<0.0050		0.072		<0.0002		0.0029	F /	<0.010		0.00094	F /	<0.010		0.0032	F /	0.0075	F / U
		10/28/2010	<0.20		<0.020		<0.010		0.053		<0.0040		0.00059	F / U	<0.010		<0.0050		0.002	F /	0.088	F /	<0.0050		0.18		<0.0002		0.0031	F /	<0.010		<0.0050		<0.010		<0.0050		<0.020	
		1/28/2011	<0.20		<0.020		<0.010		0.054		<0.0040		<0.0020		<0.010		<0.0050		<0.010		<0.20		<0.0050		0.23		<0.0002		0.004	F /	<0.010		<0.0050		<0.010		0.0034	F /	<0.020	
		4/19/2011	<0.20		0.0032	F /	<0.010		0.05		<0.0040		0.0014	F / U	<0.010		<0.0050		<0.010		<0.20		<0.0050		0.077		<0.0002		0.001	F /	0.0033	F /	<0.0050		<0.010		<0.0050		0.013	F /
		7/28/2011	<0.20		0.0034	F /	<0.010		0.047		<0.0040		0.001	F / U	<0.010		<0.0050		0.0016	F /	<0.20		<0.0050		0.083		<0.0002		0.0029	F /	<0.010		<0.0050		<0.010		<0.0050		<0.020	
		10/13/2011	<0.20		<0.020		<0.010		0.043		<0.0040		0.0012	F /	<0.010		0.00058	F /	<0.010		<0.20		<0.0050		0.083		<0.0002		0.0029	F /	<0.010		<0.0050		<0.010		<0.0050		<0.020	
		2/29/2012	<0.20		0.0035	F / U	<0.010		0.044		<0.0040		<0.0020		0.001	F /	0.0011	F /	<0.010		<0.20		0.0016	F / U	0.043		<0.20		0.0044	F /	<0.010		<0.0050		<0.010		0.0047	F /	<0.020	
		4/16/2012	0.034	F /	<0.020		<0.010		0.041		<0.0040		0.00098	F /	<0.010		<0.0050		<0.010		0.14	F /	<0.0050		0.078		<0.20	U / UJ	0.0042	F /	<0.010		<0.0050		<0.010		<0.0050		<0.020	
		4/16/2012 (DUP)	<0.20		<0.020		<0.010		0.042		<0.0040		0.001	F /	<0.010		<0.0050		<0.010		0.38		<0.0050		0.078		<0.20	U / UJ	0.0063	F /	<0.010		<0.0050		<0.010		<0.0050		0.011	F /
		7/17/2012	<0.2		0.0032	F /	<0.01		0.048		<0.004		0.0011	F /	<0.01		<0.005		0.0022	F /	<0.2		<0.005		0.096			U / R	0.0035	F /	<0.01		<0.005		<0.01		<0.005		<0.02	
		10/25/2012	<0.2		<0.02		<0.01		0.05		<0.004		<0.002		<0.01		0.0011	F /	<0.01		<0.2		<0.005		0.18		<0.2		0.0051	F /	<0.01		<0.005		<0.01		0.0046	F /	<0.02	
		1/30/2013	<0.3		<0.02		<0.025		0.051		<0.0015		<0.005		0.00067	F /	0.0012	F /	0.0022	F /	<0.1		<0.015		0.18		<0.0002		0.0065	F /	<0.022		<0.015		0.012	F / B	<0.015		0.0046	F /
		4/9/2013	<0.3		<0.02		<0.025		0.043		<0.0015		0.00071	F /	<0.015		0.0012	F /	0.0016	F /	<0.1		<0.015		0.069		<0.0002		0.0039	F /	<0.022		<0.015		<0.04		0.0015	F /	<0.15	
		4/19/2013 (DUP)	<0.3		<0.02		<0.025		0.043		<0.0015		0.00076	F /	<0.015		0.0012	F /	<0.015		<0.1		<0.015		0.069		<0.0002		0.0039	F /	<0.022		<0.015		<0.04		0.0017	F /	<0.15	
		7/31/2013	<0.3		0.0036	F /	<0.025		0.044		<0.0015		0.00064	F /	<0.015		<0.015		<0.015		<0.1		<0.015		0.063		<0.2		0.0028	F /	<0.022		<0.005		<0.04		<0.015		<0.15	
		10/15/2013	<0.3		<0.02		<0.025		0.05		<0.0015		0.00077	F /	<0.015		<0.015		0.0017	F /	<0.1		<0.015		0.18		<0.2		0.0042	F /	<0.022		<0.005		<0.04		<0.015		<0.15	
	MW362	10/15/2013 (DUP)	<0.3		<0.02		<0.025		0.05		<0.0015		0.00086	F /	<0.015		<0.015		<0.015		<0.1		<0.015		0.18		<0.2		0.0039	F /	<0.022		<0.005		<0.04		<0.015		<0.15	
		10/21/2014	<0.3		<0.02		<0.025		0.053		<0.0015		<0.005		<0.015		0.0012	F /	0.0031	F /	<0.1		<0.015		0.18		<0.0002		0.0067	F /	<0.022		<0.015		<0.04		0.0017	F /	<0.15	
		10/21/2014 (DUP)	<0.3		<0.02		<0.025		0.051		<0.0015		<0.005		<0.015		<0.015		0.0033	F /	0.023	F /	<0.015		0.18		<0.0002		0.0067	F /	<0.022		<0.015		<0.04		0.0012	F /	<0.15	
		11/19/2014	<0.3		0.0046	F /	<0.025		0.05		<0.0015		<0.005		<0.015		<0.015		<0.015		<0.1		<0.015		0.18		<0.0002		0.0058	F /	<0.022		0.0018	F / B	<0.04		<0.015		<0.15	
		11/19/2014 (DUP)	<0.3		<0.02		<0.025		0.052		<0.0015		<0.005		<0.015		<0.015		0.0014	F /	<0.1		<0.015		0.19		<0.0002		0.006	F /	<0.022		0.0017	F / B	<0.04		<0.015		0.0045	F /
		12/16/2014	<0.3		<0.02		0.0076	F / B	0.055		<0.0015		<0.005		<0.015		<0.015		0.0018	F /	<0.1		<0.015		0.21		<0.0002		0.0061	F /	<0.022		<0.015		<0.04		<0.015		<0.15	
		8/20/2015	<0.40		<0.020		<0.015		0.051		<0.0050		0.0006	/ U	<0.010		0.0015	/ U	<0.010		<0.10		<0.010		0.18		<0.00020		0.004	J	<0.020	/ UJ	<0.010		<0.050		<0.050		<0.020	
		8/20/2015 (DUP)	<0.40		<0.020		<0.015		0.051		<0.0050		<0.0050		<0.010		0.0014	/ U	<0.010		<0.10		<0.010		0.18		<0.00020		0.0042	J	<0.020	/ UJ	<0.010		<0.050		<0.050		<0.020	
		10/26/2015	<0.4		<0.02		<0.015		0.055		<0.005		<0.005		<0.01		<0.025		<0.01		<0.1		<0.01		0.21		<0.0002		0.0049	J /	<0.02		<0.01		<0.05		<0.05		<0.02	
		10/26/2015 (DUP)	<0.4		<0.02		<0.015		0.055		<0.005		<0.005		<0.01		<0.025		<0.01		<0.1		<0.01		0.21		<0.0002		0.0046	J /	<0.02		<0.01		<0.05		<0.05		<0.02	
		4/25/2016	< 0.40		< 0.020		< 0.015		0.059		< 0.0050		< 0.0050		0.0011	J/	< 0.025		0.0056	J /	< 0.10		< 0.010		0.22		0.000083	J /	0.0047	J/	< 0.020		< 0.010		< 0.050		< 0.050		< 0.020	
		4/25/2016 (DUP)	< 0.40		< 0.020		< 0.015		0.061		< 0.0050		< 0.0050		< 0.010		0.0014	J /	0.0057	J /	< 0.10		< 0.010		0.22		0.000076	J /	0.0045	J/	< 0.020		< 0.010		< 0.050		< 0.050		< 0.020	
		10/5/2016	<0.40		<0.020		<0.015		0.053		<0.0050		<0.0050		<0.010		0.0014	J /	<0.010		<0.10		<0.010		0.22		<0.00020		0.0053	J /	<0.020		<0.010		<0.050		<0.050		<0.020	
		10/5/2016 (DUP)	<0.40		<0.020		<0.015		0.052		<0.0050		<0.0050		<0.010		0.0016	J /	<0.010		<0.10		<0.010		0.22		<0.00020		0.0054	J /	<0.020		<0.010		<0.050		<0.050		<0.020	
		4/24/2017	<0.40		<0.020		0.0027	BJ / UB	0.056		0.00091	J /	0.0008	J /	0.0012	J /	0.0024	J /	<0.010		<0.10		0.0055	J / UB	0.2		<0.00020		<0.040		<0.020		<0.010		0.0052	J / UB	<0.050		<0.020	
		4/24/2017 (DUP)	<0.40		<0.020		0.0037	BJ / UB	0.056		0.00084	J /	0.0006	J /	0.001	J /	0.0018	J /	<0.010		<0.10		<0.010		0.2		<0.00020		<0.040		<0.020		<0.010		<0.050		<0.050		<0.020	
		10/10/2017	<0.4		<0.02		<0.015		0.058		<0.005		<0.005		<0.01		<0.025		<0.01		<0.1		<0.01		0.21		<0.0002		0.0099	J /	<0.02		<0.01		<0.05		<0.05		<0.02	
		10/10/2017 (DUP)	<0.4		<0.02		0.0027	BJ / U	0.057		<0.005		<0.005		<0.01		<0.025		<0.01		<0.1		<0.01		0.2		<0.0002		0.0098	J /	<0.02		<0.01		<0.05		<0.05		<0.02	
		4/16/2018	<0.4		<0.02		0.0036	J /	0.058		<0.005		<0.005		<0.01		<0.025		<0.01		<0.1		<0.01		0.2		<0.0002		0.0081	J /	<0.02		<0.01		<0.05		<0.05		<0.02	
		4/16/2018 (DUP)	<0.4		<0.02		0.0038	J /	0.059		<0.005		0.0006	J /	<0.01		<0.025		<0.01		<0.1		<0.01		0.2		<0.0002		0.0094	J /	<0.02		<0.01		0.0064	J /	<0.05		<0.02	
		10/9/2018	<0.4		<0.02		0.0048	J /	0.061		<0.005		0.0007	J /	<0.01		<0.025		<0.01		<0.1		<0.01		0.2		<0.0002		<0.04		<0.02		<0.01		<0.05		0.0089	J /	<0.02	
		10/9/2018 (DUP)	<0.4		<0.02		0.0046	J /	0.057		<0.005		0.0009	J /	<0.01		<0.025		<0.01		<0.1		<0.01		0.19		<0.0002		<0.04		<0.02		<0.01		<0.05		0.0086	J /	<0.02	

TABLE B2

Summary of Analytical Results - Metals
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Analyte	Aluminum		Antimony		Arsenic		Barium		Beryllium		Cadmium		Chromium		Cobalt		Copper		Iron		Lead		Manganese		Mercury		Nickel		Selenium		Silver		Thallium		Vanadium		Zinc	
		Units	mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
		Project Action Limit[1]	100		0.024		0.2		NS		NS		0.05		1.0		NS		NS		5.0		0.1		10		NS		NS		NS		0.511		NS		NS		10	
Site	Well	Date	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF
		Downgradient																																						
M13	MW808	5/15/2008	0.018	F /	<0.02		<0.01		0.18		<0.004		<0.002		<0.01		0.0073		0.0014	F /	0.042	F /	<0.005		0.9		<0.0002		0.019		<0.01		<0.005		<0.01		<0.005		0.057	
		8/19/2008	<0.2		<0.02		<0.01		0.19		<0.004		<0.002		<0.01		0.0062		0.00084	F /	<0.15		<0.005		1.1		<0.0002		0.021		<0.01		<0.005		<0.01		0.0021	F /	0.0058	F /
		10/21/2008	<0.2		<0.02		<0.01		0.17		<0.004		<0.002		<0.01		0.013		<0.01		0.96		<0.005		1.2		<0.0002		0.021		<0.01		<0.005		<0.01		0.005		0.044	
		10/21/2008 (DUP)	0.021	F /	<0.02		<0.01		0.17		<0.004		<0.002		<0.01		0.014		<0.01		0.95		0.0019	F /	1.2		0.0001	F /	0.021		<0.01		<0.005		<0.01		0.0056		0.052	
		2/4/2009	0.02	F /	<0.020		<0.010		0.27		<0.0040		<0.0020		<0.010		0.03		<0.010		2.8		<0.0050		2.4		<0.0002		0.054		<0.010		<0.0050		<0.010		0.005		<0.020	F / U
		2/4/2009 (DUP)	0.018	F /	<0.020		<0.010		0.25		<0.0040		<0.0020		<0.010		0.029		<0.010		2.7		<0.0050		2.3		<0.0002		0.052		<0.010		<0.0050		<0.010		0.0049	F /	<0.020	F / U
		5/4/2009	<0.20		<0.020		<0.010		0.24		<0.0040		<0.0020		<0.010		0.0093		<0.010		0.1		<0.0050		1.5		<0.0002		0.014		<0.010		<0.0050		<0.010		<0.0050		<0.020	
		5/4/2009 (DUP)	<0.20		<0.020		<0.010		0.25		<0.0040		<0.0020		<0.010		0.01		<0.010		0.087	F /	<0.0050		1.6		<0.0002		0.015		<0.010		<0.0050		<0.010		<0.0050		<0.020	
		7/29/2009	<0.2		<0.02		<0.01		0.19		<0.004		<0.002		<0.01		0.018		<0.01		1.8		0.0036	F / U	1.6		<0.0002		0.019		<0.01		<0.005		<0.01		0.0038	F /	<0.02	
		10/29/2009	<0.20		<0.020		<0.010		0.2		<0.0040		<0.0020		<0.010		0.015		<0.010		4.3		<0.0050		1.5		<0.0002		0.025		<0.010		<0.0050		<0.010		0.0035	F /	<0.020	
		1/15/2010	<0.20		0.0024	F / U	<0.010		0.18		<0.0040		<0.0020		<0.010		0.019		<0.010		2.2		<0.0050		1.4		<0.0002		0.026		<0.010		<0.0050		<0.010		0.0031	F /	<0.020	
		4/13/2010	<0.20		<0.020		0.002	F /	0.19		<0.0040		<0.0020		<0.010		0.019		<0.010		**7.9**		<0.0050		1.3		<0.0002		0.03		<0.010		<0.0050		<0.010		0.0031	F /	<0.020	
		7/20/2010	<0.20		<0.020		0.0042	F /	0.19		<0.0040		<0.0020		<0.010		0.018		<0.010		**7.8**		0.0017	F /	1.1		<0.0002		0.031		<0.010		0.0013	F /	<0.010		0.0032	F /	0.015	F / U
		7/20/2010 (DUP)	<0.20		<0.020		0.0038	F /	0.19		<0.0040		<0.0020		<0.010		0.018		<0.010		**7.9**		0.0018	F /	1.1		<0.0002		0.03		<0.010		<0.0050		<0.010		0.0035	F /	0.012	F / U
		10/29/2010	0.029	F /	0.0035	F /	<0.010		0.16		<0.0040		0.00081	F / U	<0.010		0.0082		<0.010		1.1		<0.0050		1.3		<0.0002		0.018		<0.010		<0.0050		<0.010		<0.0050		<0.020	
		1/27/2011	<0.20		<0.020		<0.010		0.17		<0.0040		<0.0020		<0.010		0.0058		<0.010		0.31		<0.0050		2		<0.0002		0.023		<0.010		<0.0050		<0.010		0.002	F /	<0.020	
		1/27/2011 (DUP)	<0.20		<0.020		<0.010		0.17		<0.0040		<0.0020		<0.010		0.0061		<0.010		0.4		<0.0050		2		<0.0002		0.023		<0.010		<0.0050		<0.010		0.0025	F /	<0.020	
		4/18/2011	<0.20		0.0041	F /	<0.010		0.2		<0.0040		0.0012	F / U	<0.010		0.037		<0.010		4.5		<0.0050		1.9		<0.0002		0.036		<0.010		<0.0050		<0.010		<0.0050		0.015	F /
		4/18/2011 (DUP)	<0.20		0.0038	F /	<0.010		0.2		<0.0040		0.0012	F / U	<0.010		0.038		<0.010		4.7		<0.0050		1.9		<0.0002		0.036		0.0029	F /	<0.0050		<0.010		<0.0050		0.015	F /
		7/28/2011	<0.20		<0.020		<0.010		0.17		<0.0040		0.001	F / U	<0.010		0.0067		<0.010		0.23		<0.0050		1.2		<0.0002		0.013		<0.010		<0.0050		<0.010		<0.0050		<0.020	
		7/28/2011 (DUP)	<0.20		<0.020		<0.010		0.18		<0.0040		0.0011	F / U	<0.010		0.0072		0.0019	F /	0.23		<0.0050		1.3		<0.0002		0.013		<0.010		0.00099	F /	<0.010		<0.0050		<0.020	
		10/12/2011	<0.20		<0.020		<0.010		0.17		<0.0040		0.00094	F /	<0.010		0.015		0.0018	F /	5		<0.0050		1.2		<0.0002		0.021		0.0036	F /	<0.0050		<0.010		<0.0050		<0.020	
		2/29/2012	<0.20		0.0033	F / U	<0.010		0.16		<0.0040		<0.0020		<0.010		0.0082		<0.010		1.7		<0.0050		0.55		<0.20		0.022		<0.010		<0.0050		<0.010		0.004	F /	0.0066	F /
		4/16/2012	<0.20		<0.020		<0.010		0.14		<0.0040		0.00081	F /	<0.010		0.016		0.0011	F /	2.6		<0.0050		0.89		<0.20	U / UJ	0.026		<0.010		<0.0050		<0.010		<0.0050		0.0069	F /
		7/18/2012	<0.2		<0.02		<0.01		0.23		<0.004		0.00099	F /	<0.01		0.022		0.0019	F /	4.2		<0.005		1.1			U / R	0.028		<0.01		<0.005		<0.01		<0.005		<0.02	
		7/18/2012 (DUP)	<0.2		<0.02		<0.01		0.23		<0.004		0.0011	F /	<0.01		0.021		0.0017	F /	3.9		<0.005		1.1			U / R	0.028		<0.01		<0.005		<0.01		<0.005		<0.02	
		10/25/2012	<0.2		0.0034	F / U	<0.01		0.22		<0.004		<0.002		0.0010	F / U	0.021		<0.01		3		<0.005		1.4		<0.2		0.029		<0.01		<0.005		<0.01		0.0052		<0.02	
		1/30/2013	<0.3		<0.02		<0.025		0.23		<0.0015		0.0007	F /	<0.015		0.0079	F /	0.0048	F /	1.9		<0.015		0.85		<0.0002		0.023	F /	<0.022		<0.015		0.0087	F / B	0.0029	F /	0.0095	F /
		4/9/2013	<0.3		<0.02		<0.025		0.072		<0.0015		0.00098	F /	<0.015		0.01	F /	0.002	F /	0.097	F /	<0.015		1.6		<0.0002		0.033	F /	<0.022		<0.015		<0.04		0.0077	F /	0.0045	F /
		7/31/2013	<0.3		<0.02		<0.025		0.073		<0.0015		0.00069	F /	<0.015		0.0021	F /	0.0016	F /	<0.1		<0.015		0.72		<0.2		0.011	F /	<0.022		<0.005		<0.04		0.0013	F /	<0.15	
		10/15/2013	0.78		<0.02		<0.025		0.098		<0.0015		0.0011	F /	0.0014	F /	0.01	F /	0.0021	F /	1.3		<0.015		3		<0.2		0.032	F /	<0.022		<0.005		<0.04		0.0027	F /	0.0093	F /
		10/20/2014	<0.3		<0.02		0.0049	F / B	0.059		<0.0015		0.00066	F /	<0.015		<0.015		0.0038	F /	<0.1		<0.015		1.5		<0.0002		0.04		<0.022		<0.015		<0.04		0.0014	F /	<0.15	
		11/18/2014	<0.3		<0.02		<0.025		0.058		<0.0015		0.00051	F /	<0.015		0.0017	F /	<0.015		<0.1		<0.015		1.6		<0.0002		0.023	F /	<0.022		<0.015		<0.04		0.0011	F /	<0.15	
		12/15/2014	<0.3		<0.02		<0.025		0.061		<0.0015		<0.005		<0.015		0.0016	F /	0.0014	F /	<0.1		<0.015		1.7		<0.0002		0.023	F /	<0.022		<0.015		<0.04		<0.015		<0.15	
		8/19/2015	<0.40		<0.020		<0.015		0.075		<0.0050		<0.0050		<0.010		<0.025		<0.010		<0.10		<0.010		0.4		<0.00020		0.0089	J	<0.020		<0.010		<0.050		<0.050		<0.020	
		10/26/2015	<0.4		<0.02		<0.015		0.082		<0.005		<0.005		<0.01		0.0039	J /	<0.01		<0.1		<0.01		1.3		<0.0002		0.021	J /	<0.02		<0.01		<0.05		<0.05		<0.02	
		4/25/2016	< 0.40		< 0.020		< 0.015		0.067		< 0.0050		< 0.0050		< 0.010		0.0017	J /	0.0065	J/	< 0.10		< 0.010		0.27		0.000082	J /	0.0055	J/	< 0.020		< 0.010		< 0.050		< 0.050		< 0.020	
		10/5/2016	<0.40		<0.020		<0.015		0.086		<0.0050		<0.0050		<0.010		<0.025		<0.010		<0.10		<0.010		0.92		<0.00020		0.022	J /	<0.020		<0.010		<0.050		<0.050		<0.020	
		4/24/2017	<0.40		<0.020		0.0023	BJ / UB	0.079		0.00051	J /	<0.0050		0.0011	J /	<0.025		<0.010		<0.10		0.0052	J / UB	0.064		<0.00020		<0.040		<0.020		<0.010		<0.050		<0.050		<0.020	
		10/10/2017	<0.4		<0.02		<0.015		0.12		<0.005		<0.005		<0.01		<0.025		0.002	J /	<0.1		<0.01		0.14		<0.0002		0.0057	J /	<0.02		<0.01		<0.05		<0.05		<0.02	
		4/16/2018	<0.4		<0.02		<0.015		0.067		<0.005		<0.005		<0.01		<0.025		<0.01		<0.1		<0.01		0.24		<0.0002		0.0073	J /	<0.02		<0.01		<0.05		<0.05		<0.02	
		10/9/2018	<0.4		<0.02		0.0027	J /	0.085		<0.005		0.0009	J /	<0.01		<0.025		0.0031	J /	<0.1		<0.01		0.85		<0.0002		0.013	J /	<0.02		<0.01		<0.05		<0.05		<0.02	
	MW809	5/15/2008	<0.2		<0.02		<0.01		0.029		<0.004		<0.002		<0.01		<0.005		<0.01		<0.15		<0.005		0.0056	F /	<0.0002		0.0027	F /	<0.01		<0.005		<0.01		<0.005		0.041	
		8/19/2008	<0.2		<0.02		<0.01		0.028		<0.004		<0.002		<0.01		<0.005		0.0015	F /	<0.15		<0.005		0.003	F /	<0.0002		<0.01		<0.01		<0.005		<0.01		0.0013	F /	0.0074	F /
		10/21/2008	0.019	F /	<0.02		<0.01		0.032		<0.004		<0.002		<0.01		<0.005		<0.01		<0.15		0.0022	F /	0.027		<0.002		<0.01		<0.01		<0.005		<0.01		0.0035	F /	0.024	
		2/5/2009	<0.20		<0.020		<0.010		0.028		<0.0040		<0.0020		<0.010		0.0014	F /	<0.010		0.24		<0.0050		0.025		<0.0002		<0.010		<0.010		<0.0050		<0.010		0.0024	F /	<0.020	F / U
		5/5/2009	<0.20		<0.020		<0.010		0.037		<0.0040		<0.0020		<0.010		<0.0050		<0.010		<0.10		<0.0050		0.0022	F /	<0.0002		<0.010		<0.010		<0.0050		<0.010		<0.0050		<0.020	
		7/29/2009	<0.2		<0.02		<0.01		0.032		<0.004		<0.002		<0.01		0.00082	F /	<0.01		<0.1		<0.005		0.0023	F /	<0.0002		<0.01		<0.01		<0.005		<0.01		0.0028	F /	<0.02	
		10/29/2009	<0.20		<0.020		<0.010		0.032		<0.0040		<0.0020		<0.010		0.0022	F /	<0.010		<0.10		<0.0050		0.023		<0.0002		<0.010		<0.010		<0.0050		<0.010		0.0021	F /	<0.020	
		10/29/2009 (DUP)	<0.20		<0.020		<0.010		0.031		<0.0040		<0.0020		<0.010		<0.0050		<0.010		<0.10		<0.0050		0.019		<0.0002		<0.010		<0.010		<0.0050		<0.010		0.0019	F /	<0.020	
		1/15/2010	<0.20		0.0026	F / U	<0.010		0.029		<0.0040		<0.0020		<0.010		0.0044	F /	<0.010		0.097	F /	<0.0050		0.041		<0.0002		0.0024	F /	<0.010		0.0014	F /	<0.010		0.0031	F /	<0.020	
		4/13/2010	<0.20		<0.020		<0.010		0.033		<0.0040		<0.0020		<0.010		<0.0050		<0.010		0.067	F /	<0.0050		0.0091	F /	<0.0002		<0.010		<0.010		<0.0050		<0.010		0.002	F /	<0.020	
		7/20/2010	<0.20		<0.020		<0.010		0.033		<0.0040		<0.0020		<0.010		<0.0050		0.0017	F /	0.2	/ U	<0.0050		0.034		<0.0002		0.002	F /	<0.010		0.0011	F /	<0.010		0.0023	F /	0.013	F / U
		10/29/2010	<0.20		<0.020		<0.010		0.029		<0.0040		0.00069	F / U	<0.010		<0.0050		<0.010		<0.20		0.002	F /	0.0086	F /	<0.0002		<0.010		<0.010		<0.0050		<0.010		<0.0050		<0.020	
		10/29/2010 (DUP)	<0.20		<0.020		<0.010		0.028		<0.0040		0.00052	F / U	<0.010		<0.0050		<0.010		0.047	F /	0.002	F /	0.0085	F /	<0.0002		<0.010		<0.010		<0.0050		<0.010		<0.0050		0.0045	F /
		1/27/2011	<0.20		<0.020		<0.010		0.026		<0.0040		<0.0020		<0.010		<0.0050		<0.010		0.15	F /	<0.0050		0.02		<0.0002		<0.010		<0.010		<0.0050		<0.010		0.0017	F /	<0.020	
		4/19/2011	<0.20		<0.020		<0.010		0.026		<0.0040		0.00091	F / U	<0.010		<0.0050		<0.010		0.66		<0.0050		0.019		<0.0002		<0.010		<0.010		<0.0050		<0.010		<0.0050		0.016	F /
		7/28/2011	<0.20		<0.020		<0.010		0.029		<0.0040		0.00062	F / U	<0.010		<0.0050		<0.010		0.045	F /	<0.0050		0.0016	F /	<0.0002		<0.010		<0.010		<0.0050		<0.010		<0.0050		<0.020	
		10/12/2011	<0.20		0.0033	F /	<0.010		0.029		<0.0040		0.00076	F /	<0.010		<0.0050		<0.010		0.08	F /	<0.0050		0.0024	F /	<0.0002		<0.010		0.0025	F /	<0.0050		<0.010		<0.0050		<0.020	
		10/12/2011 (DUP)	<0.20		<0.020		<0.010		0.028		<0.0040		0.00081	F /	<0.010		<0.0050		0.0015	F /	<0.20		<0.0050		0.0023	F /	<0.0002		<0.010		0.0026	F /	<0.0050		<0.010		<0.0050		<0.020	
		2/29/2012	<0.20		0.0028	F / U	<0.010		0.031		<0.0040		<0.0020		<0.010		<0.0050		<0.010		<0.20		<0.0050		0.0055	F /	<0.20		<0.010		<0.010		<0.0050		<0.010		0.0022	F /	<0.020	
		2/29/2012 (DUP)	<0.20		0.0031	F / U	<0.010		0.031		<0.0040		<0.0020		<0.010		<0.0050		<0.010		<0.20		0.0016	F / U	0.0059	F /	<0.20		<0.010		<0.010		<0.0050		<0.010		0.0024	F /	<0.020	
		4/16/2012	0.028	F /	<0.020		<0.010		0.028		<0.0040		0.00065	F /	<0.010		<0.0050		<0.010		0.094	F /	<0.0050		0.0024	F /	<0.20	U / UJ	0.0044	F /	<0.010		<0.0050		<0.010		<0.0050		0.0073	F /
		7/18/2012	<0.2		<0.02		<0.01		0.029		<0.004		0.00075	F /	<0.01		<0.005		0.0014	F /	<0.2		<0.005		0.0018	F /		U / R	<0.01		<0.01		<0.005		<0.01		<0.005		<0.02	
		10/25/2012	<0.2		<0.02		<0.01		0.029		<0.004		<0.002		<0.01		<0.005		<0.01		<0.2		<0.005		0.0038	F /	<0.2		<0.01		<0.01		<0.005		<0.01		0.0029	F /	<0.02	
		10/25/2012 (DUP)	<0.2		0.0027	F / U	<0.01		0.029		<0.004		<0.002		0.0019	F / U	<0.005		<0.01		<0.2		<0.005		0.0038	F /	<0.2		<0.01		<0.01		<0.005		<0.01		0.0029	F /	<0.02	
		1/30/2013	<0.3		<0.02		<0.025		0.028		<0.0015		<0.005		<0.015		<0.015		<0.015		0.042	F /	<0.015		0.012		<0.0002		0.0013	F /	<0.022		<0.015		0.0065	F / B	<0.015		<0.15	
		4/9/2013	<0.3		<0.02		<0.025		0.024		<0.0015		<0.005		<0.015		<0.015		<0.015		0.11		<0.015		0.014		<0.0002		<0.04		<0.022		<0.015		<0.04		<0.015		<0.15	
		7/31/2013	<0.3		<0.02		<0.025		0.028		<0.0015		<0.002		<0.015		<0.015		<0.015		<0.1		<0.015		0.0012	F /	<0.2		<0.04		<0.022		<0.005		<0.04		<0.015		<0.15	
		7/31/2013 (DUP)	<0.3		<0.02		<0.025		0.028		<0.0015		<0.002		<0.015		<0.015		<0.015		<0.1		<0.015		0.0011	F /	<0.2		<0.04		<0.022		<0.005		<0.04		<0.015		<0.15	
		10/15/2013	<0.3		<0.02		<0.025		0.029		<0.0015		0.00047	F /	<0.015		<0.015		<0.015		0.031	F /	<0.015		0.003	F /	<0.2		<0.04		<0.022		<0.005		<0.04		<0.015		<0.15	
		10/20/2014	<0.3		<0.02		<0.025		0.034		<0.0015		<0.005		0.00084	F /	<0.015		0.0018	F /	<0.1		<0.015		0.0011	F /	<0.0002		0.0017	F /	<0.022		<0.015		<0.04		0.0011	F /	<0.15	
		11/18/2014	<0.3		<0.02		<0.025		0.03		<0.0015		<0.005		<0.015		<0.015		<0.015		0.035	F /	<0.015		0.005	F /	<0.0002		0.0015	F /	<0.022		<0.015		<0.04		<0.015		0.005	F / B
		12/15/2014	<0.3		<0.02		<0.025		0.028		<0.0015		<0.005		<0.015		<0.015		<0.015		<0.1		<0.015		0.012		<0.0002		<0.04		<0.022		<0.015		<0.04		<0.015		<0.15	
		8/19/2015	<0.40		<0.020		<0.015		0.029		<0.0050		<0.0050		<0.010		<0.025		<0.010		0.038	J	<0.010		0.0031	/ U	<0.00020		<0.040		<0.020		<0.010		<0.050		<0.050		<0.020	
		10/26/2015	<0.4		<0.02		<0.015		0.028		<0.005		<0.005		<0.01		<0.025		<0.01		<0.1		<0.01		0.003	J /	<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
		4/25/2016	< 0.40		< 0.020		< 0.015		0.030		0.00025	J/	< 0.0050		< 0.010		< 0.025		< 0.010		< 0.10		< 0.010		0.0017	J/	0.000082	J/	< 0.040		< 0.020		< 0.010		< 0.050		< 0.050		< 0.020	
		10/5/2016	<0.40		<0.020		<0.015		0.029		<0.0050		<0.0050		<0.010		<0.025		<0.010		<0.10		<0.010		0.0024	J /	<0.00020		<0.040		<0.020		<0.010		<0.050		<0.050		<0.020	
		4/24/2017	<0.40		<0.020		<0.015		0.03		0.00029	J /	<0.0050		<0.010		<0.025		<0.010		<0.10		0.0076	J / UB	0.0041	J /	<0.00020		<0.040		<0.020		<0.010		<0.050		<0.050		<0.020	
		10/10/2017	<0.4		<0.02		<0.015		0.028		<0.005		<0.005		<0.01		<0.025		<0.01		<0.1		<0.01		0.002	J /	<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
		4/16/2018	<0.4		<0.02		<0.015		0.03		<0.005		<0.005		<0.01		<0.025		<0.01		<0.1		<0.01		0.0028	J /	<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
		10/9/2018	<0.4		<0.02		<0.015		0.028		<0.005		<0.005		<0.01		<0.025		<0.01		<0.1		<0.01		<0.015		<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	

TABLE B2

Summary of Analytical Results - Metals
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Analyte	Aluminum		Antimony		Arsenic		Barium		Beryllium		Cadmium		Chromium		Cobalt		Copper		Iron		Lead		Manganese		Mercury		Nickel		Selenium		Silver		Thallium		Vanadium		Zinc	
		Units	mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
		Project Action Limit[1]	100		0.024		0.2		NS		NS		0.05		1.0		NS		NS		5.0		0.1		10		NS		NS		NS		0.511		NS		NS		10	
Site	Well	Date	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF
		Downgradient																																						
M13	MW811	10/29/2014	0.44	/ J	0.0033	F /	<0.025		0.077		<0.0015		0.00086	F /	0.0023	F /	0.0018	F /	0.0058	F /	1		<0.015		0.11		<0.0002		0.01	F /	<0.022		<0.015		<0.04		0.0031	F / B	0.011	F /
		11/19/2014	0.065	F /	0.0034	F /	<0.025		0.071		<0.0015		<0.005		<0.015		0.0017	F /	0.0031	F /	0.17		<0.015		0.076		<0.0002		0.0056	F /	<0.022		0.0014	F / B	<0.04		<0.015		0.0094	F /
		12/16/2014	0.29	F /	<0.02		0.0082	F / B	0.074		<0.0015		<0.005		0.002	F /	<0.015		0.0039	F /	0.59		<0.015		0.088		<0.0002		0.0055	F /	<0.022		<0.015		<0.04		0.0021	F /	0.011	F /
		8/19/2015	<0.40		<0.020		<0.015		0.069		<0.0050		0.0006	/ U	<0.010		<0.025		<0.010		0.74		<0.010		0.053		<0.00020		<0.040		<0.020		<0.010		<0.050		<0.050		<0.020	
		10/26/2015	<0.4		<0.02		0.0023	J /	0.063		<0.005		<0.005		<0.01		<0.025		<0.01		0.46		<0.01		0.064		<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
		4/25/2016	< 0.40		< 0.020		< 0.015		0.071		< 0.0050		< 0.0050		< 0.010		< 0.025		0.0048	J/	0.95		< 0.010		0.061		0.000071	J/	< 0.040		< 0.020		< 0.010		< 0.050		< 0.050		< 0.020	
		10/5/2016	<0.40		<0.020		<0.015		0.079		<0.0050		<0.0050		<0.010		<0.025		<0.010		1.8		<0.010		0.049		<0.00020		<0.040		<0.020		<0.010		<0.050		<0.050		<0.020	
		4/24/2017	<0.40		<0.020		0.0062	BJ / UB	0.083		0.00075	J /	<0.0050		0.0012	J /	0.0013	J /	<0.010		1.4		<0.010		0.046		0.000031	BJ / UB	0.0028	J /	<0.020		<0.010		<0.050		<0.050		0.0057	J /
		10/10/2017	<0.4		<0.02		0.0044	BJ / U	0.073		<0.005		<0.005		<0.01		<0.025		<0.01		1.5		<0.01		0.055		<0.0002		0.0062	J /	<0.02		<0.01		<0.05		<0.05		<0.02	
		4/16/2018	<0.4		<0.02		0.0048	J /	0.064		<0.005		<0.005		<0.01		<0.025		<0.01		1.1		<0.01		0.055		<0.0002		0.0089	J /	<0.02		<0.01		<0.05		<0.05		<0.02	
		10/9/2018	<0.4		<0.02		0.0046	J /	0.066		<0.005		<0.005		<0.01		<0.025		<0.01		1.5		<0.01		0.045		<0.0002		<0.04		<0.02		<0.01		<0.05		0.01	J /	<0.02	
		Upgradient																																						
	MW802	5/15/2008	<0.2		<0.02		<0.01		0.018		<0.004		<0.002		<0.01		<0.005		0.0011	F /	<0.15		<0.005		0.039		<0.0002		<0.01		<0.01		<0.005		<0.01		0.0015	F /	0.0041	F /
		10/7/2008 (DUP)	<0.2		<0.02		<0.01		0.025		<0.004		<0.002		<0.01		<0.005		0.001	F /	0.026	F /	<0.005		0.12		<0.0002		<0.01		<0.01		<0.005		<0.01		0.0025	F /	0.041	
		10/7/2008	0.038	F /	<0.02		<0.01		0.027		<0.004		<0.002		<0.01		<0.005		<0.01		0.033	F /	<0.005		0.13		<0.0002		<0.01		<0.01		<0.005		<0.01		0.0029	F /	0.044	
		5/4/2009	<0.20		<0.020		<0.010		0.024		<0.0040		<0.0020		<0.010		0.0029	F /	0.0028	F /	0.14		<0.0050		0.23		<0.0002		<0.010		<0.010		<0.0050		<0.010		<0.0050		<0.020	
		10/27/2009	<0.20		<0.020		<0.010		0.037		<0.0040		<0.0020		<0.010		0.0024	F /	<0.010		0.69		<0.0050		0.8		<0.0002		0.0022	F /	<0.010		<0.0050		<0.010		0.0029	F /	<0.020	
		4/13/2010	<0.20		<0.020		<0.010		0.022		<0.0040		<0.0020		<0.010		<0.0050		<0.010		0.076	F /	<0.0050		0.4		<0.0002		<0.010		<0.010		<0.0050		<0.010		0.0018	F /	0.0047	F /
		10/28/2010	<0.20		<0.020		0.0027	F /	0.04		<0.0040		0.00042	F / U	<0.010		<0.0050		<0.010		3.6		<0.0050		0.63		<0.0002		<0.010		<0.010		<0.0050		<0.010		<0.0050		0.0039	F /
		4/15/2011	<0.2		<0.02		<0.01		0.033		<0.004		<0.002		<0.01		<0.005		<0.01		0.14	F / U	<0.005		0.01		<0.0002		0.00081	F /	0.0034	F / U	<0.005		<0.01		0.0024	F /	<0.02	
		10/11/2011	<0.20		<0.020		<0.010		0.043		<0.0040		0.001	F / U	<0.010		<0.0050		0.0019	F /	1.4		<0.0050		0.64		0.000087	F / J	<0.010		<0.010		<0.0050		<0.010		<0.0050		<0.020	
		4/16/2012	<0.20		<0.020		<0.010		0.026		<0.0040		<0.0020		<0.010		<0.0050		0.0012	F /	<0.20		<0.0050		0.75		<0.20		0.0023	F /	<0.010		<0.0050		<0.010		0.0025	F /	0.0078	F /
		10/24/2012	<0.2		<0.02		<0.01		0.099		<0.004		0.00098	F /	<0.01		<0.005		0.0018	F /	<0.2		<0.005		0.58		<0.2		<0.01		<0.01		<0.005		<0.01		0.00067	F /	<0.02	
		10/16/2013	<0.3		<0.02		<0.025		0.05		<0.0015		0.00063	F /	<0.015		<0.015		<0.015		<0.1		<0.015		0.069		<0.2		<0.04		<0.022		<0.005		<0.04		<0.015		0.0045	F / B
		12/11/2014	<0.3		<0.02		<0.025		0.057		<0.0015		0.00079	F /	0.00077	F /	<0.015		0.002	F /	<0.1		<0.015		0.019		<0.0002		0.0018	F /	<0.022		<0.015		<0.04		0.0011	F /	<0.15	
		10/28/2015	<0.4		<0.02		0.0026	J /	0.052		<0.005		<0.005		<0.01		0.0021	J /	<0.01		0.66		<0.01		1.2		<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
		10/6/2016	<0.40		<0.020		<0.015		0.048		<0.0050		<0.0050		<0.010		0.0017	J /	0.0046	J /	1.1		<0.010		0.69		<0.00020		<0.040		<0.020		<0.010		<0.050		<0.050		0.0052	J /
		10/9/2017	<0.4		<0.02		<0.015		0.048		<0.005		<0.005		<0.01		<0.025		<0.01		0.15		<0.01		0.18		<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
		10/2/2018	<0.4		<0.02		<0.015		0.064		<0.005		0.0008	J /	<0.01		<0.025		<0.01		2	/ J	<0.01		1.2		<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
	MW803	10/7/2008	<0.2		<0.02		<0.01		0.028		<0.004		<0.002		<0.01		<0.005		0.00093	F /	<0.15		<0.005		<0.01		<0.0002		<0.01		<0.01		<0.005		<0.01		0.0019	F /	0.018	F /
		5/4/2009	<0.20		<0.020		<0.010		0.028		<0.0040		<0.0020		<0.010		0.001	F /	<0.010		<0.10		<0.0050		<0.010		<0.0002		<0.010		<0.010		<0.0050		<0.010		<0.0050		<0.020	
		10/27/2009	<0.20		<0.020		<0.010		0.027		<0.0040		<0.0020		<0.010		<0.0050		<0.010		<0.10		<0.0050		<0.010		<0.0002		0.0018	F /	<0.010		<0.0050		<0.010		0.0022	F /	<0.020	
		4/13/2010	<0.20		<0.020		<0.010		0.027		<0.0040		<0.0020		<0.010		<0.0050		0.0012	F /	<0.20		<0.0050		<0.010		<0.0002		<0.010		<0.010		<0.0050		<0.010		0.0021	F /	0.0046	F /
		10/28/2010	<0.20		<0.020		<0.010		0.027		<0.0040		0.00039	F / U	<0.010		<0.0050		<0.010		<0.20		<0.0050		<0.010		<0.0002		<0.010		<0.010		<0.0050		<0.010		<0.0050		<0.020	
		4/15/2011	<0.2		<0.02		<0.01		0.027		<0.004		<0.002		<0.01		<0.005		<0.01		<0.2		<0.005		<0.01		<0.0002		0.0015	F /	<0.01		<0.005		<0.01		0.0019	F /	<0.02	
		10/11/2011	<0.20		<0.020		<0.010		0.026		<0.0040		0.0008	F / U	<0.010		<0.0050		0.0019	F /	<0.20		<0.0050		<0.010		0.000093	F / J	<0.010		<0.010		<0.0050		<0.010		<0.0050		<0.020	
		10/24/2012	<0.2		<0.02		<0.01		0.028		<0.004		0.0012	F /	<0.01		<0.005		<0.01		<0.2		<0.005		<0.01		<0.2		<0.01		<0.01		<0.005		<0.01		<0.005		<0.02	
		10/16/2013	<0.3		<0.02		<0.025		0.027		<0.0015		0.00055	F /	<0.015		<0.015		<0.015		<0.1		<0.015		0.00027	F /	<0.2		<0.04		<0.022		<0.005		<0.04		<0.015		0.0047	F / B
		12/15/2014	<0.3		<0.02		<0.025		0.028		<0.0015		<0.005		0.0007	F /	<0.015		<0.015		<0.1		<0.015		<0.01		<0.0002		0.0016	F /	<0.022		<0.015		<0.04		<0.015		<0.15	
		10/28/2015	<0.4		<0.02		<0.015		0.026		<0.005		<0.005		<0.01		<0.025		<0.01		<0.1		<0.01		<0.015		<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
		10/6/2016	<0.40		<0.020		<0.015		0.025		<0.0050		<0.0050		<0.010		<0.025		<0.010		<0.10		<0.010		<0.015		<0.00020		<0.040		<0.020		<0.010		<0.050		<0.050		<0.020	
		10/9/2017	<0.4		<0.02		<0.015		0.034		<0.005		<0.005		<0.01		<0.025		<0.01		<0.1		<0.01		<0.015		<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
		10/2/2018	<0.4		<0.02		<0.015		0.027		<0.005		<0.005		<0.01		<0.025		<0.01		<0.1		<0.01		<0.015		<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
M11[2]		***Downgradient***																																						
	MW333	5/12/2008	<0.2		<0.02		<0.01		0.19		<0.004		<0.002		<0.01		<0.005		<0.01		<0.15		<0.005		<0.01		<0.0002		<0.01		<0.01		<0.005		<0.01		<0.005		0.026	
		10/6/2008	<0.2		<0.02		<0.01		0.22		<0.004		<0.002		<0.01		0.0014	F /	<0.01		0.72		<0.005		1		<0.0002		<0.01		<0.01		<0.005		<0.01		0.0029	F /	0.0065	F /
		5/5/2009	<0.20		<0.020		<0.010		0.17		<0.0040		<0.0020		<0.010		0.00072	F /	<0.010		0.074	F /	<0.0050		0.042		<0.0002		<0.010		<0.010		<0.0050		<0.010		<0.0050		<0.020	
		10/28/2009	<0.20		<0.020		<0.010		0.18		<0.0040		<0.0020		<0.010		0.00061	F /	<0.010		0.28		<0.0050		1.2		<0.0002		<0.010		<0.010		<0.0050		<0.010		0.0023	F /	<0.020	
		4/13/2010	<0.20		<0.020		<0.010		0.14		<0.0040		<0.0020		<0.010		<0.0050		0.0018	F /	<0.20		<0.0050		<0.010		<0.0002		<0.010		<0.010		<0.0050		<0.010		0.0021	F /	0.0038	F /
		10/28/2010	<0.20		<0.020		<0.010		0.16		<0.0040		0.00064	F / U	<0.010		0.0015	F /	<0.010		0.4		<0.0050		1		<0.0002		<0.010		<0.010		<0.0050		<0.010		<0.0050		0.006	F /
		4/18/2011	<0.20		0.0034	F /	<0.010		0.14		<0.0040		0.001	F / U	<0.010		<0.0050		<0.010		<0.20		<0.0050		<0.010		<0.0002		<0.010		<0.010		<0.0050		<0.010		<0.0050		<0.020	
		10/11/2011	<0.20		<0.020		<0.010		0.12		<0.0040		0.00083	F / U	<0.010		<0.0050		0.0016	F /	<0.20		<0.0050		0.099		<0.0002		<0.010		<0.010		<0.0050		<0.010		<0.0050		<0.020	
		10/24/2012	<0.2		<0.02		<0.01		0.1		<0.004		0.00073	F /	<0.01		<0.005		<0.01		<0.2		<0.005		0.011		<0.2		<0.01		<0.01		<0.005		<0.01		<0.005		<0.02	
		10/16/2013	<0.3		<0.02		<0.025		0.096		<0.0015		0.0007	F /	<0.015		<0.015		<0.015		<0.1		<0.015		0.0021	F /	<0.2		<0.04		<0.022		<0.005		<0.04		<0.015		<0.15	
		12/15/2014	<0.3		<0.02		<0.025		0.084		<0.0015		<0.005		<0.015		<0.015		<0.015		<0.1		<0.015		0.00078	F /	<0.0002		<0.04		<0.022		<0.015		<0.04		<0.015		<0.15	
		10/28/2015	<0.4		<0.02		0.003	J /	0.078		<0.005		0.0006	J /	<0.01		<0.025		<0.01		<0.1		<0.01		0.00099	J /	<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
		10/6/2016	<0.40		<0.020		<0.015		0.076		<0.0050		<0.0050		<0.010		<0.025		<0.010		<0.10		<0.010		<0.015		<0.00020		<0.040		<0.020		<0.010		<0.050		<0.050		<0.020	
		10/9/2017	<0.4		<0.02		<0.015		0.073		<0.005		<0.005		<0.01		<0.025		<0.01		<0.1		<0.01		<0.015		<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
		10/2/2018	<0.4		<0.02		<0.015		0.073		<0.005		0.0007	J /	<0.01		<0.025		<0.01		<0.1		<0.01		<0.015		<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
	MW334	5/12/2008	<0.2		<0.02		<0.01		0.023		<0.004		<0.002		<0.01		<0.005		<0.01		<0.15		<0.005		0.024		<0.0002		<0.01		<0.01		<0.005		<0.01		<0.005		0.074	
		10/6/2008	<0.2		<0.02		<0.01		0.034		<0.004		<0.002		<0.01		0.0036	F /	<0.01		3.4		<0.005		1.1		<0.0002		<0.01		<0.01		<0.005		<0.01		0.0053		0.01	F /
		5/5/2009	<0.20		<0.020		<0.010		0.025		<0.0040		<0.0020		<0.010		0.0016	F /	<0.010		0.049	F /	<0.0050		0.027		<0.0002		<0.010		<0.010		<0.0050		<0.010		<0.0050		<0.020	F / U
		10/28/2009	<0.20		<0.020		0.0037	F /	0.039		<0.0040		<0.0020		<0.010		0.0047	F /	<0.010		**5.2**		<0.0050		0.83		<0.0002		<0.010		<0.010		<0.0050		<0.010		0.0041	F /	<0.020	
		4/13/2010	<0.20		<0.020		<0.010		0.027		<0.0040		<0.0020		<0.010		<0.0050		<0.010		<0.20		<0.0050		0.056		<0.0002		<0.010		<0.010		<0.0050		<0.010		0.005		<0.020	
		10/28/2010	<0.20		0.0043	F /	0.002	F /	0.034		<0.0040		0.00084	F / U	<0.010		0.003	F /	<0.010		3.4		<0.0050		0.57		<0.0002		<0.010		<0.010		0.00091	F / U	<0.010		<0.0050		<0.020	
		4/18/2011	<0.20		0.0034	F /	<0.010		0.027		<0.0040		0.0013	F / U	<0.010		<0.0050		<0.010		0.056	F /	<0.0050		0.044		<0.0002		<0.010		<0.010		<0.0050		<0.010		<0.0050		<0.020	
		10/11/2011	<0.20		0.0037	F /	<0.010		0.037		<0.0040		0.00099	F / U	<0.010		<0.0050		0.0017	F /	0.92		<0.0050		0.76		0.00016	F / J	<0.010		<0.010		<0.0050		<0.010		<0.0050		<0.020	
		10/11/2011 (DUP)	<0.20		0.0039	F /	<0.010		0.037		<0.0040		0.0011	F / U	<0.010		<0.0050		0.0018	F /	0.71		<0.0050		0.75		0.00016	F / J	<0.010		<0.010		<0.0050		<0.010		<0.0050		<0.020	
		10/24/2012	<0.2		<0.02		<0.01		0.038		<0.004		0.0011	F /	<0.01		0.0012	F /	<0.01		2		<0.005		0.52		<0.2		<0.01		<0.01		<0.005		<0.01		0.00073	F /	<0.02	
		10/16/2013	<0.3		<0.02		<0.025		0.045		<0.0015		0.00079	F /	<0.015		<0.015		<0.015		0.08	F /	<0.015		0.83		<0.2		<0.04		<0.022		<0.005		<0.04		<0.015		0.0057	F / B
		12/15/2014	<0.3		<0.02		<0.025		0.041		<0.0015		<0.005		<0.015		<0.015		<0.015		0.055	F /	<0.015		0.56		<0.0002		0.0013	F /	<0.022		<0.015		<0.04		<0.015		<0.15	
		10/28/2015	<0.4		<0.02		0.0043	J /	0.045		<0.005		<0.005		<0.01		<0.025		<0.01		2.5		<0.01		0.68		<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
		10/6/2016	<0.40		<0.020		<0.015		0.048		<0.0050		<0.0050		<0.010		0.0018	J /	<0.010		2.2		<0.010		0.78		<0.00020		<0.040		<0.020		<0.010		<0.050		<0.050		<0.020	
		10/9/2017	<0.4		<0.02		<0.015		0.051		<0.005		0.0007	J /	<0.01		<0.025		<0.01		0.068	J /	<0.01		1		<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
		10/2/2018	<0.4		<0.02		<0.015		0.052		<0.005		0.0009	J /	<0.01		<0.025		<0.01		0.72		<0.01		0.81		<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	

TABLE B2

Summary of Analytical Results - Metals
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Analyte	Aluminum		Antimony		Arsenic		Barium		Beryllium		Cadmium		Chromium		Cobalt		Copper		Iron		Lead		Manganese		Mercury		Nickel		Selenium		Silver		Thallium		Vanadium		Zinc	
		Units	mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
		Project Action Limit[1]	100		0.024		0.2		NS		NS		0.05		1.0		NS		NS		5.0		0.1		10		NS		NS		NS		0.511		NS		NS		10	
Site	Well	Date	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF
																					Downgradient																			
M11[2]	MW335	5/13/2008	0.024	F /	<0.02		<0.01		0.016		<0.004		<0.002		<0.01		0.0011	F /	0.0028	F /	<0.15		<0.005		0.083		<0.0002		0.0031	F /	<0.01		<0.005		<0.01		<0.005		0.06	
		10/7/2008	<0.2		<0.02		<0.01		0.021		<0.004		<0.002		<0.01		<0.005		0.0053	F /	<0.15		<0.005		0.1		<0.0002		0.0045	F /	<0.01		<0.005		<0.01		0.0071		0.032	
		10/7/2008 (DUP)	0.028	F /	<0.02		<0.01		0.02		<0.004		<0.002		<0.01		0.0012	F /	<0.01		0.79		<0.005		0.13		<0.0002		0.0042	F /	<0.01		<0.005		<0.01		0.0054		0.0026	F /
		5/4/2009	<0.20		<0.020		<0.010		0.018		<0.0040		<0.0020		<0.010		0.001	F /	0.007	F /	<0.10		<0.0050		<0.010		<0.0002		<0.010		<0.010		<0.0050		<0.010		<0.0050		<0.020	
		10/28/2009	<0.20		<0.020		<0.010		0.025		<0.0040		<0.0020		<0.010		0.0073		<0.010		0.051	F /	<0.0050		1.4		<0.0002		0.011		<0.010		<0.0050		<0.010		0.0052		<0.020	
		4/13/2010	<0.20		<0.020		<0.010		0.017		<0.0040		<0.0020		<0.010		<0.0050		0.005	F /	<0.20		<0.0050		0.0088	F /	<0.0002		0.002	F /	<0.010		<0.0050		<0.010		0.0049	F /	<0.020	
		4/13/2010 (DUP)	<0.20		<0.020		<0.010		0.018		<0.0040		<0.0020		<0.010		<0.0050		0.005	F /	<0.20		<0.0050		0.0086	F /	<0.0002		0.0024	F /	<0.010		<0.0050		<0.010		0.0061		<0.020	
		10/28/2010	<0.20		0.0037	F /	<0.010		0.024		<0.0040		0.001	F / U	<0.010		<0.0050		0.0071	F /	<0.20		<0.0050		0.29		<0.0002		0.0041	F /	<0.010		<0.0050		<0.010		<0.0050		0.0047	F /
		4/15/2011	<0.2		<0.02		<0.01		0.018		<0.004		<0.002		<0.01		<0.005		0.004	F /	<0.2		<0.005		<0.01		<0.0002		0.0018	F /	<0.01		<0.005		<0.01		0.0032	F /	0.0079	F /
		10/12/2011	<0.20		<0.020		<0.010		0.022		<0.0040		0.001	F /	<0.010		<0.0050		0.0066	F /	0.042	F /	<0.0050		0.057		<0.0002		0.0011	F /	<0.010		<0.0050		<0.010		<0.0050		<0.020	
		4/16/2012	<0.20		<0.020		<0.010		0.021		<0.0040		<0.0020		<0.010		<0.0050		0.0051	F /	<0.20		<0.0050		<0.010		<0.20		0.0024	F /	<0.010		<0.0050		<0.010		0.0047	F /	0.0047	F /
		10/24/2012	<0.2		<0.02		<0.01		0.027		<0.004		0.0012	F /	<0.01		<0.005		0.0081	F /	<0.2		<0.005		0.076		<0.2		0.0037	F /	<0.01		<0.005		<0.01		<0.005		0.0051	F /
		10/16/2013	<0.3		<0.02		<0.025		0.036		<0.0015		0.00081	F /	<0.015		0.0018	F /	<0.015		0.48		<0.015		2.8		<0.2		0.0017	F /	<0.022		<0.005		<0.04		0.0013	F /	<0.15	
		10/16/2013 (DUP)	<0.3		<0.02		<0.025		0.036		<0.0015		0.0011	F /	<0.015		0.0019	F /	<0.015		0.49		<0.015		2.9		<0.2		0.0016	F /	<0.022		<0.005		<0.04		0.0016	F /	<0.15	
		12/11/2014	<0.3		<0.02		0.0079	F /	0.038		<0.0015		0.00054	F /	0.0014	F /	0.0025	F /	<0.015		0.23		<0.015		2		<0.0002		0.0038	F /	<0.022		<0.015		<0.04		0.0014	F /	0.0061	F /
		12/11/2014 (DUP)	<0.3		0.0034	F /	0.0073	F /	0.039		<0.0015		0.0005	F /	<0.015		0.0025	F /	0.0014	F /	0.21		<0.015		2.1		<0.0002		0.0037	F /	<0.022		0.00099	F /	<0.04		0.0012	F /	<0.15	
		10/28/2015	<0.4		<0.02		0.0079	J /	0.1		<0.005		<0.005		<0.01		<0.025		<0.01		0.14		<0.01		2.1		<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
		10/6/2016	<0.40		<0.020		<0.015		0.096		<0.0050		<0.0050		<0.010		0.0024	J /	<0.010		1		<0.010		1.2		<0.00020		<0.040		<0.020		<0.010		<0.050		<0.050		<0.020	
		10/6/2016 (DUP)	<0.40		<0.020		0.0029	J /	0.09		<0.0050		<0.0050		<0.010		0.0025	J /	<0.010		0.98		<0.010		1.1		<0.00020		<0.040		<0.020		<0.010		<0.050		<0.050		<0.020	
		10/9/2017	<0.4		<0.02		0.0074	J /	0.1		<0.005		<0.005		<0.01		<0.025		<0.01		1.3		<0.01		1.2		<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
		10/2/2018	<0.4		<0.02		<0.015		0.088		<0.005		0.0007	J /	<0.01		<0.025		<0.01		1.4		<0.01		1.3		<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
	MW336	5/13/2008	0.018	F /	<0.02		<0.01		0.019		<0.004		<0.002		<0.01		<0.005		<0.01		0.11	F /	<0.005		0.042		<0.0002		<0.01		<0.01		<0.005		<0.01		0.0013	F /	0.034	
		10/7/2008	0.022	F /	<0.02		<0.01		0.02		<0.004		<0.002		<0.01		0.0017	F /	<0.01		0.77		<0.005		0.13		<0.0002		0.0042	F /	<0.01		<0.005		<0.01		0.0058		0.004	F /
		5/5/2009	<0.20		<0.020		<0.010		0.019		<0.0040		<0.0020		<0.010		<0.0050		<0.010		<0.10		<0.0050		0.0077	F /	<0.0002		<0.010		<0.010		<0.0050		<0.010		<0.0050		<0.020	
		5/5/2009 (DUP)	<0.20		<0.020		<0.010		0.019		<0.0040		<0.0020		<0.010		0.00047	F /	<0.010		<0.10		<0.0050		0.0051	F /	<0.0002		<0.010		<0.010		<0.0050		<0.010		<0.0050		<0.020	
		10/27/2009	<0.20		<0.020		<0.010		0.021		<0.0040		<0.0020		<0.010		0.0004	F /	<0.010		0.54		<0.0050		0.14		<0.0002		<0.010		<0.010		<0.0050		<0.010		0.0044	F /	<0.020	
		10/27/2009 (DUP)	<0.20		<0.020		<0.010		0.021		<0.0040		<0.0020		<0.010		<0.0050		<0.010		0.54		<0.0050		0.14		<0.0002		0.0016	F /	<0.010		<0.0050		<0.010		0.0042	F /	<0.020	
		4/13/2010	<0.20		<0.020		<0.010		0.019		<0.0040		<0.0020		<0.010		<0.0050		<0.010		<0.20		<0.0050		0.007	F /	<0.0002		0.002	F /	<0.010		<0.0050		<0.010		0.0038	F /	<0.020	
		10/28/2010	<0.20		0.0051	F /	<0.010		0.028		<0.0040		0.00084	F / U	<0.010		0.0014	F /	<0.010		1.2		<0.0050		0.36		<0.0002		<0.010		<0.010		<0.0050		<0.010		<0.0050		<0.020	
		4/18/2011	<0.20		0.0038	F /	<0.010		0.023		<0.0040		0.0013	F / U	<0.010		<0.0050		<0.010		0.096	F /	<0.0050		0.019		<0.0002		<0.010		<0.010		<0.0050		<0.010		<0.0050		<0.020	
		10/12/2011	<0.20		<0.020		<0.010		0.029		<0.0040		0.0011	F /	<0.010		0.0046	F /	0.0018	F /	1.7		<0.0050		0.42		<0.0002		0.0029	F /	<0.010		<0.0050		<0.010		<0.0050		<0.020	
		4/16/2012	<0.20		<0.020		<0.010		0.02		<0.0040		<0.0020		<0.010		<0.0050		0.0011	F /	0.15	F /	<0.0050		0.033		<0.20		<0.010		<0.010		<0.0050		<0.010		0.004	F /	0.0069	F /
		10/24/2012	<0.2		<0.02		<0.01		0.024		<0.004		0.001	F /	<0.01		0.0015	F /	0.0016	F /	0.24		<0.005		0.15		<0.2		0.0036	F /	<0.01		<0.005		<0.01		<0.005		<0.02	
		10/24/2012 (DUP)	<0.2		0.0046	F /	<0.01		0.025		<0.004		0.001	F /	<0.01		0.0018	F /	0.0014	F /	0.29		<0.005		0.16		<0.2		0.0047	F /	<0.01		<0.005		<0.01		<0.005		0.0056	F /
		10/16/2013	<0.3		<0.02		<0.025		0.029		<0.0015		0.001	F /	<0.015		0.0071	F /	<0.015		1.9		<0.015		0.61		<0.2		0.0032	F /	<0.022		<0.005		<0.04		0.0011	F /	<0.15	
		12/11/2014	<0.3		<0.02		<0.025		0.025		<0.0015		0.00053	F /	<0.015		0.0014	F /	<0.015		0.17		<0.015		0.33	/ J	<0.0002		0.0035	F /	<0.022		<0.015		<0.04		0.0012	F /	<0.15	
		10/28/2015	<0.4		<0.02		0.0044	J /	0.035		<0.005		<0.005		<0.01		0.0029	J /	<0.01		4	/ J	<0.01		0.48	/ J	<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
		10/28/2015 (DUP)	<0.4		<0.02		<0.015		0.079		<0.005		<0.005		<0.01		<0.025		<0.01		<0.1	/ J	<0.01		<0.015	/ J	<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
		10/6/2016	<0.40		<0.020		<0.015		0.035		<0.0050		<0.0050		<0.010		0.005	J /	<0.010		2.4		<0.010		0.62		<0.00020		<0.040		<0.020		<0.010		<0.050		<0.050		<0.020	
		10/9/2017	<0.4		<0.02		<0.015		0.034		<0.005		<0.005		<0.01		0.0081	J /	<0.01		0.99		<0.01		0.47		<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
		10/2/2018	<0.4		<0.02		<0.015		0.028		<0.005		0.0006	J /	<0.01		0.0051	J /	<0.01		0.14		<0.01		0.36		<0.0002		0.0053	J /	<0.02		<0.01		<0.05		<0.05		<0.02	
	MW804	5/15/2008	0.017	F /	<0.02		<0.01		0.025		<0.004		<0.002		<0.01		<0.005		0.00086	F /	<0.15		<0.005		0.31		<0.0002		<0.01		<0.01		<0.005		<0.01		0.0014	F /	0.0031	F /
		10/6/2008	0.019	F /	<0.02		<0.01		0.031		<0.004		<0.002		<0.01		<0.005		0.0034	F /	<0.15		<0.005		0.036		<0.0002		0.0038	F /	<0.01		<0.005		<0.01		0.0059		0.059	
		5/7/2009	<0.2	U / UJ	<0.02	U / UJ	<0.01	U / UJ	0.019	/ J	<0.004	U / UJ	<0.002	U / UJ	<0.01	U / UJ	0.0031	F / J	<0.01	U / UJ	<0.1	U / UJ	<0.005	U / UJ	0.038	/ J	<0.0002		<0.01	U / UJ	<0.01	U / UJ	<0.005	U / UJ	<0.01	U / UJ	<0.005	U / UJ	<0.02	U / UJ
		10/27/2009	<0.20		<0.020		<0.010		0.028		<0.0040		<0.0020		<0.010		<0.0050		<0.010		<0.10		<0.0050		0.039		<0.0002		0.0019	F /	<0.010		<0.0050		<0.010		0.0038	F /	<0.020	
		4/13/2010	<0.20		<0.020		<0.010		0.023		<0.0040		<0.0020		<0.010		<0.0050		<0.010		<0.20		<0.0050		0.12		<0.0002		<0.010		<0.010		<0.0050		<0.010		0.0042	F /	0.0043	F /
		10/28/2010	<0.20		<0.020		<0.010		0.066		<0.0040		0.00086	F / U	<0.010		0.0023	F /	<0.010		2		<0.0050		0.58		<0.0002		0.0024	F /	<0.010		<0.0050		<0.010		<0.0050		<0.020	
		4/15/2011	<0.2		<0.02		<0.01		0.024		<0.004		<0.002		<0.01		<0.005		0.0019	F /	<0.2		<0.005		<0.01		<0.0002		0.0015	F /	<0.01		<0.005		<0.01		0.0032	F /	<0.02	
		4/15/2011 (DUP)	<0.2		<0.02		<0.01		0.024		<0.004		<0.002		<0.01		<0.005		0.0017	F /	<0.2		<0.005		<0.01		<0.0002		0.0012	F /	0.0026	F / U	<0.005		<0.01		0.0036	F /	<0.02	
		10/11/2011	<0.20		0.0028	F /	<0.010		0.042		<0.0040		0.0011	F / U	<0.010		<0.0050		0.0018	F /	0.44		<0.0050		0.088		0.00011	F / J	0.0027	F /	<0.010		<0.0050		<0.010		<0.0050		<0.020	
		10/24/2012	<0.2		0.0056	F /	<0.01		0.076		<0.004		0.00074	F /	<0.01		0.0028	F /	0.0016	F /	1.7		<0.005		0.53		<0.2		<0.01		<0.01		0.0073		<0.01		0.0063		<0.02	
		10/16/2013	<0.3		<0.02		<0.025		0.052		<0.0015		0.00095	F /	<0.015		<0.015		<0.015		0.27		<0.015		0.3		<0.2		0.0013	F /	<0.022		<0.005		<0.04		<0.015		0.0079	F / B
		12/11/2014	<0.3		0.0038	F /	0.0067	F /	0.032		<0.0015		0.00058	F /	<0.015		<0.015		<0.015		0.11		<0.015		0.04		<0.0002		0.0042	F /	<0.022		<0.015		<0.04		0.0015	F /	<0.15	
		10/28/2015	<0.4		<0.02		0.0039	J /	0.045		<0.005		<0.005		<0.01		<0.025		<0.01		1.3		<0.01		0.29		<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
		10/6/2016	<0.40		<0.020		<0.015		0.039		<0.0050		<0.0050		<0.010		<0.025		<0.010		0.66		<0.010		0.18		<0.00020		<0.040		<0.020		<0.010		<0.050		<0.050		<0.020	
		10/9/2017	<0.4		<0.02		<0.015		0.055		<0.005		<0.005		<0.01		<0.025		<0.01		0.13		<0.01		0.11		<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	
		10/2/2018	<0.4		<0.02		<0.015		0.044		<0.005		0.0008	J /	<0.01		<0.025		<0.01		0.36		<0.01		0.13		<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02	

TABLE B2

Summary of Analytical Results - Metals
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Analyte	**Aluminum**		**Antimony**		**Arsenic**		**Barium**		**Beryllium**		**Cadmium**		**Chromium**		**Cobalt**		**Copper**		**Iron**		**Lead**		**Manganese**		**Mercury**		**Nickel**		**Selenium**		**Silver**		**Thallium**		**Vanadium**		**Zinc**	
		Units	mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
		Project Action Limit[1]	100		0.024		0.2		NS		NS		0.05		1.0		NS		NS		5.0		0.1		10		NS		NS		NS		0.511		NS		NS		10			
Site	**Well**	**Date**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**
			Downgradient																																							
M11[2]	MW805	10/6/2008	<0.2		<0.02		<0.01		0.029		<0.004		<0.002		<0.01		<0.005		0.0011	F /	0.035	F /	<0.005		0.0092	F /	<0.0002		0.0076	F /	<0.01		<0.005		<0.01		0.005	F /	0.085		
		5/7/2009	<0.2	U / UJ	<0.02	U / UJ	<0.01	U / UJ	0.029	/ J	<0.004	U / UJ	<0.002	U / UJ	<0.01	U / UJ	<0.005	U / UJ	<0.01	U / UJ	<0.1	U / UJ	<0.005	U / UJ	<0.01	U / UJ	<0.0002		0.0042	F / J	<0.01	U / UJ	<0.005	U / UJ	<0.01	U / UJ	<0.005	U / UJ	<0.02	U / UJ
		10/27/2009	<0.20		<0.020		<0.010		0.027		<0.0040		<0.0020		<0.010		<0.0050		<0.010		<0.10		<0.0050		<0.010		<0.0002		0.0048	F /	<0.010		<0.0050		<0.010		0.0042	F /	<0.020		
		4/13/2010	<0.20		<0.020		<0.010		0.031		<0.0040		<0.0020		<0.010		<0.0050		0.0012	F /	<0.20		<0.0050		<0.010		<0.0002		0.005	F /	<0.010		<0.0050		<0.010		0.0042	F /	0.0044	F /
		11/2/2010	<0.20		<0.020		<0.010		0.036		<0.0040		0.00092	F / U	<0.010		0.0016	F /	<0.010		1.2		<0.0050		0.026		<0.0002		0.0034	F /	<0.010		<0.0050		<0.010		<0.0050		<0.020		
		4/15/2011	<0.2		<0.02		<0.01		0.033		<0.004		<0.002		<0.01		<0.005		0.0014	F /	<0.2		<0.005		<0.01		<0.0002		0.0055	F /	<0.01		<0.005		<0.01		0.0036	F /	<0.02		
		10/11/2011	<0.20		0.0029	F /	<0.010		0.03		<0.0040		0.001	F / U	<0.010		<0.0050		0.0023	F /	<0.20		<0.0050		0.004	F /	<0.0002		0.0029	F /	<0.010		<0.0050		<0.010		<0.0050		<0.020		
		4/16/2012	<0.20		<0.020		<0.010		0.028		<0.0040		<0.0020		<0.010		<0.0050		0.0016	F /	<0.20		<0.0050		<0.010		<0.20		0.0059	F /	<0.010		<0.0050		<0.010		0.0037	F /	0.0078	F /
		10/24/2012	<0.2		<0.02		<0.01		0.029		<0.004		0.00098	F /	<0.01		<0.005		0.0018	F /	0.099	F /	<0.005		0.0094	F /	<0.2		0.004	F /	<0.01		<0.005		<0.01		<0.005		<0.02		
		10/16/2013	<0.3		<0.02		<0.025		0.037		<0.0015		0.00098	F /	<0.015		<0.015		<0.015		0.031	F /	<0.015		0.062		<0.2		<0.04		<0.022		<0.005		<0.04		<0.015		<0.15		
		12/11/2014	<0.3		<0.02		0.012	F /	0.039		<0.0015		<0.005		0.00072	F /	<0.015		0.0014	F /	0.081	F /	<0.015		0.037		<0.0002		0.0016	F /	<0.022		<0.015		<0.04		<0.015		<0.15		
		10/28/2015	<0.4		<0.02		0.008	J /	0.038		<0.005		<0.005		<0.01		<0.025		<0.01		1.1		<0.01		0.034		<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02		
		10/28/2015 (DUP)	<0.4		<0.02		0.0077	J /	0.038		<0.005		<0.005		<0.01		<0.025		<0.01		1.1		<0.01		0.034		<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02		
		10/6/2016	<0.40		<0.020		<0.015		0.035		<0.0050		<0.0050		<0.010		0.0017	J /	<0.010		1.1		<0.010		0.028		<0.00020		<0.040		<0.020		<0.010		<0.050		<0.050		<0.020		
		10/9/2017	<0.4		<0.02		<0.015		0.029		<0.005		<0.005		<0.01		<0.025		<0.01		0.07	J /	<0.01		0.0029	J /	<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02		
		10/9/2017 (DUP)	<0.4		<0.02		<0.015		0.031		<0.005		<0.005		<0.01		<0.025		<0.01		0.071	J /	<0.01		0.0029	J /	<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02		
		10/2/2018	<0.4		<0.02		<0.015		0.029		<0.005		0.0006	J /	<0.01		<0.025		<0.01		<0.1		<0.01		<0.015		<0.0002		<0.04		<0.02		<0.01		<0.05		<0.05		<0.02		

Notes:
An abbreviated list of analytes is used for reporting based on historically detected and reported analytes.
Data since the sampling round conducted immediately prior to the completion of each individual site remedial action are shown.
mg/L = Milligrams per liter.
NS = No standard.
LF/VF = Lab flag/validation flag.
< = Result shows laboratory Method Reporting Limit for non-detected results.
F = Concentration below the reported detection limit.
U = Not detected.
DUP = Duplicate.
J = Estimated concentration.
UJ = Estimated detection limit.
B = Blank contamination.
R = Rejected data, unusable.
Bolded result indicates Project Action Limit (Remedial Goal [RG]) exceedance.

Footnotes:
(1) Project Action Limits are the RGs as specified in Table 6-2 of the 1998 Record of Decision. Where no RG is presented in the 1998 Record of Decision, the Project Action Limit is obtained from Illinois Environmental Protection Agency Class II groundwater standards.
(2) Site M11 sampled only during Annual round.

B3 - SUMMARY OF HISTORICAL GROUNDWATER RESULTS – INDICATOR PARAMETERS

TABLE B3

Summary of Analytical Results - Indicator Parameters
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	Nitrate		Sulfate	
		Units	mg/L		mg/L	
		Project Action Limit[1]	10		400	
		Surface Water RG[2]	NS		500	
Site	**Well**	**Date**	**Result**	**LF/VF**	**Result**	**LF/VF**
		In-Plume				
M1	MW107	4/30/2008	NA		**21,000**	
		10/8/2008	NA		**12,000**	
		5/2/2009	NA		**49,000**	
		10/29/2009	NA		**34,000**	
		4/12/2010	NA		**30,000**	
		10/31/2010	NA		**26,000**	
		4/20/2011	NA		**26,000**	
		10/15/2011	NA		**23,000**	
		4/12/2012	NA		**26,000**	
		10/25/2012	NA		**22,000**	
		4/11/2013	NA		**17,000**	
		10/22/2013	NA		**20,000**	
		10/29/2014	NA		**16,000**	
		12/8/2014	NA		**16,000**	
		8/21/2015	NA		**19,000**	
		10/22/2015	NA		**11,000**	
		4/27/2016	NA		**5,400**	
		10/12/2016	NA		**10,000**	
		4/18/2017	NA		**4,300**	
		10/3/2017	NA		**3,900**	
		10/3/2017 DUP	NA		**3,800**	
		4/13/2018	NA		**2,700**	
		10/2/2018	NA		**9,800**	
	MW231	4/30/2008	NA		**32,000**	
		10/8/2008	8.1		**35,000**	
		5/2/2009	NA		**41,000**	
		10/29/2009	NA		**38,000**	
		4/9/2010	NA		**41,000**	
		10/31/2010	NA		**32,000**	
		4/20/2011	NA		**34,000**	
		10/15/2011	NA		**32,000**	
		10/15/2011 (DUP)	NA		**33,000**	
		4/12/2012	NA		**35,000**	
		10/25/2012	NA		**36,000**	
		4/12/2013	NA		**32,000**	
		10/22/2013	NA		**33,000**	
		10/28/2014	NA		**35,000**	
		10/28/2014 (DUP)	NA		**30,000**	
		12/8/2014	NA		**34,000**	
		8/21/2015	NA		**35,000**	
		8/21/2015 (DUP)	NA		**34,000**	
		10/22/2015	NA		**33,000**	
		4/27/2016	NA		**36,000**	
		10/11/2016	NA		**32,000**	
		10/11/2016 (DUP)	NA		**32,000**	
		4/18/2017	NA		**30,000**	
		10/3/2017	NA		**33,000**	
		4/13/2018	NA		**32,000**	
		(DUP)	NA		**33,000**	
		10/3/2018	NA		**33,000**	
		(DUP)	NA		**33,000**	
	MW640	4/30/2008	NA		**4,100**	
		10/8/2008	NA		**2,400**	
		10/8/2008 (DUP)	NA		**2,700**	
		5/2/2009	NA		**5,000**	
		10/29/2009	NA		**5,000**	
		4/12/2010	NA		**5,200**	
		10/31/2010	NA		**5,000**	
		4/19/2011	NA		**5,400**	
		10/15/2011	NA		**5,100**	
		4/12/2012	NA		**5,200**	
		10/25/2012	NA		**4,300**	
		4/15/2013	NA		**6,800**	
		10/22/2013	NA		**5,800**	
		10/28/2014	NA		**6,300**	
		12/8/2014	NA		**5,500**	
		8/21/2015	NA		**3,700**	
		10/22/2015	NA		**3,400**	
		4/27/2016	NA		**4,800**	
		10/11/2016	NA		**4,000**	
		4/18/2017	NA		**4,000**	
		10/3/2017	NA		**2,200**	
		4/13/2018	NA		**3,900**	
		10/2/2018	NA		**3,800**	

TABLE B3

Summary of Analytical Results - Indicator Parameters
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	Nitrate		Sulfate	
		Units	mg/L		mg/L	
		Project Action Limit[1]	10		400	
		Surface Water RG[2]	NS		500	
Site	**Well**	**Date**	**Result**	**LF/VF**	**Result**	**LF/VF**
M1		***In-Plume***				
	MW641	4/30/2008	NA		**940**	
		4/30/2008 (DUP)	NA		**930**	
		10/8/2008	NA		**1,000**	
		5/2/2009	NA		**820**	
		10/29/2009	NA		**910**	
		4/12/2010	NA		**920**	
		10/31/2010	NA		**1,300**	
		4/20/2011	NA		**670**	
		10/17/2011	NA		**1,100**	
		4/12/2012	NA		**640**	
		4/12/2012	NA		**640**	
		10/25/2012	NA		**1,100**	
		4/12/2013	NA		**480**	
		4/12/2013 (DUP)	NA		**480**	
		10/22/2013	NA		**1,000**	
		10/29/2014	NA		**690**	
		12/8/2014	NA		**650**	
		8/21/2015	NA		**600**	
		10/22/2015	NA		**680**	
		4/27/2016	NA		**520**	
		10/11/2016	NA		390	
		4/18/2017	NA		340	
		10/4/2017	NA		**550**	
		4/10/2018	NA		250	
		10/3/2018	NA		**470**	
	MW642	5/7/2008	NA		380	
		10/9/2008	NA		**430**	
		5/2/2009	NA		**440**	
		10/29/2009	NA		**430**	
		4/12/2010	NA		**430**	
		4/12/2010 (DUP)	NA		**450**	
		10/31/2010	NA		**460**	
		4/20/2011	NA		**430**	
		4/20/2011 (DUP)	NA		**500**	
		10/17/2011	NA		**410**	
		4/12/2012	NA		**420**	
		4/12/2012 (DUP)	NA		**420**	
		10/25/2012	NA		390	
		10/25/2012 (DUP)	NA		400	
		4/15/2013	NA		**410**	
		10/22/2013	NA		390	
		10/29/2014	NA		**420**	
		12/8/2014	NA		390	
		8/21/2015	NA		390	
		10/22/2015	NA		360	
		4/27/2016	NA		380	
		10/11/2016	NA		320	
		4/18/2017	NA		330	
		10/4/2017	NA		310	
		4/10/2018	NA		280	
		10/3/2018	NA		290	
		Early Warning				
	MW643	4/29/2008	NA		130	
		10/8/2008	NA		93	
		5/2/2009	NA		110	
		10/28/2009	NA		53	
		10/28/2009 (DUP)	NA		52	
		4/12/2010	NA		59	
		11/1/2010	NA		25	
		4/18/2011	NA		54	
		10/15/2011	NA		38	
		4/13/2012	NA		58	
		10/26/2012	NA		160	
		4/11/2013	NA		160	
		10/21/2013	NA		73	
		10/28/2014	NA		75	
		12/8/2014	NA		85	
		12/8/2014 (DUP)	NA		84	
		8/21/2015	NA		69	
		10/22/2015	NA		42	
		4/28/2016	NA		100	
		10/11/2016	NA		38	
		4/19/2017	NA		42	
		10/4/2017	NA		27	
		4/13/2018	NA		78	
		10/3/2018	NA		38	

TABLE B3

Summary of Analytical Results - Indicator Parameters
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	**Nitrate**		**Sulfate**	
		Units	mg/L		mg/L	
		Project Action Limit[1]	10		400	
		Surface Water RG[2]	NS		500	
Site	**Well**	**Date**	**Result**	**LF/VF**	**Result**	**LF/VF**
M1			***Early Warning***			
	MW644	4/29/2008	NA		240	
		4/29/2008 (DUP)	NA		240	
		10/8/2008	NA		95	
		5/2/2009	NA		240	
		10/28/2009	NA		120	/ U
		4/12/2010	NA		140	
		11/1/2010	NA		170	
		4/18/2011	NA		170	
		10/15/2011	NA		180	
		4/13/2012	NA		160	
		10/26/2012	NA		86	
		4/11/2013	NA		150	
		10/21/2013	NA		160	
		10/28/2014	NA		180	
		12/8/2014	NA		160	
		8/21/2015	NA		190	
		10/22/2015	NA		170	
		4/28/2016	NA		170	
		10/11/2016	NA		150	
		4/19/2017	NA		140	
		10/4/2017	NA		140	
		4/13/2018	NA		130	
		10/3/2018	NA		140	
			Compliance			
	MW645	4/29/2008	NA		94	
		10/8/2008	NA		100	
		5/2/2009	NA		65	
		10/28/2009	NA		65	
		4/12/2010	NA		57	
		11/1/2010	NA		70	
		4/18/2011	NA		90	
		10/15/2011	NA		88	
		4/13/2012	NA		67	
		10/25/2012	NA		90	
		4/11/2013	NA		100	
		10/21/2013	NA		110	
		10/27/2014	NA		110	
		12/8/2014	NA		**550**	
		8/20/2015	NA		100	
		10/21/2015	NA		91	
		4/28/2016	NA		72	
		10/11/2016	NA		46	
		4/18/2017	NA		40	
		10/4/2017	NA		56	
		4/10/2018	NA		60	
		10/3/2018	NA		78	
	MW646	4/29/2008	NA		140	
		10/8/2008	NA		100	
		5/2/2009	NA		130	
		10/28/2009	NA		100	/ J
		4/12/2010	NA		190	
		11/1/2010	NA		150	
		4/19/2011	NA		120	
		10/15/2011	NA		120	
		4/13/2012	NA		110	
		10/25/2012	NA		110	
		4/11/2013	NA		110	
		10/21/2013	NA		110	
		10/27/2014	NA		120	
		12/8/2014	NA		**570**	
		8/20/2015	NA		130	
		10/21/2015	NA		110	
		4/28/2016	NA		120	
		10/11/2016	NA		98	
		4/18/2017	NA		97	
		10/4/2017	NA		99	/ J
		4/10/2018	NA		100	
		10/3/2018	NA		110	

TABLE B3

Summary of Analytical Results - Indicator Parameters
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	**Nitrate**		**Sulfate**	
		Units	mg/L		mg/L	
		Project Action Limit[1]	10		400	
		Surface Water RG[2]	NS		500	
Site	**Well**	**Date**	**Result**	**LF/VF**	**Result**	**LF/VF**
M1	***Compliance***					
	MW649	4/29/2008	NA		100	
		10/8/2008	NA		120	
		10/8/2008 (DUP)	NA		120	
		10/29/2009	NA		100	
		4/12/2010	NA		57	
		11/1/2010	NA		240	
		4/20/2011	NA		86	
		10/17/2011	NA		68	
		4/13/2012	NA		64	
		10/25/2012	NA		120	
		4/11/2013	NA		190	
		10/22/2013	NA		170	
		10/28/2014	NA		150	
		12/8/2014	NA		**1,500**	
		8/21/2015	NA		100	
		10/22/2015	NA		140	
		4/28/2016	NA		67	
		10/11/2016	NA		61	
		4/18/2017	NA		41	
		10/4/2017	NA		100	
		4/13/2018	NA		47	
		10/3/2018	NA		110	
	SW709	5/2/2009	NA		33	
		10/26/2009	NA		39	
		4/12/2010	NA		43	
		11/1/2010	NA		86	
		4/18/2011	NA		54	
		10/15/2011	NA		47	
		4/13/2012	NA		60	
		10/26/2012	NA		180	
		4/11/2013	NA		59	
		10/22/2013	NA		34	/ J
		10/28/2014	NA		68	
		12/8/2014	NA		76	
		8/20/2015	NA		69	
		10/22/2015	NA		72	
		4/27/2016	NA		63	
		10/11/2016	NA		36	
		4/19/2017	NA		40	/ J
		10/3/2017	NA		59	/ J
		4/13/2018	NA		55	
		10/3/2018	NA		65	
M8	***In-Plume***					
	MW330	10/21/2003		J / R	**500**	/ J
		5/21/2004	NA		**570**	
		10/21/2004	NA		**440**	
		10/19/2005	NA		340	
		5/4/2006	NA		**510**	
		10/12/2006	NA		**560**	
		4/30/2007	NA		**570**	
		4/30/2007 (DUP)	NA		370	
		10/16/2007	NA		**540**	
		5/19/2008	NA		**570**	
		5/6/2009	NA		**530**	/ J
		10/23/2009	NA		**410**	/ J
		4/9/2010	NA		**410**	
		11/3/2010	NA		**460**	
		4/20/2011	NA		**420**	
		10/18/2011	NA		**440**	
		4/17/2012	NA		**430**	
		10/23/2012	NA		**440**	
		4/10/2013	NA		**530**	
		10/17/2013	NA		**590**	
		10/17/2013 (DUP)	NA		**600**	
		10/20/2014	NA		**570**	
		12/16/2014	NA		**580**	
		8/20/2015	NA		**590**	
		10/23/2015	NA		**540**	
		4/21/2016	NA		**520**	
		4/21/2016 (DUP)	NA		**500**	
		10/4/2016	NA		**500**	
		4/19/2017	NA		**510**	
		4/19/2017 (DUP)	NA		**510**	
		10/6/2017	NA		**440**	
		4/10/2018	NA		**440**	
		10/8/2018	NA		**460**	

TABLE B3

Summary of Analytical Results - Indicator Parameters
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	Nitrate		Sulfate	
		Units	mg/L		mg/L	
		Project Action Limit[1]	10		400	
		Surface Water RG[2]	NS		500	
Site	**Well**	**Date**	**Result**	**LF/VF**	**Result**	**LF/VF**
			Upgradient			
M13	MW806	5/15/2008	0.18		86	
		8/19/2008	<0.1		59	
		10/21/2008	0.093	F /	85	
		2/4/2009	0.49	/ J	75	
		5/5/2009	<0.10	/ U	70	
		7/29/2009	0.18		74	
		10/28/2009	0.12	/ J	63	/ J
		1/15/2010	0.34		69	
		4/14/2010	0.57		77	
		7/21/2010	0.092	F /	69	
		10/28/2010	0.055	F / J	80	
		1/27/2011	0.37		70	/ J
		4/19/2011	0.34		76	
		7/28/2011	0.16	/ J	79	
		10/12/2011	<0.10	U / UJ	66	
		2/29/2012	0.39		79	
		4/16/2012	0.39	/ J	80	
		7/17/2012	0,19	/ J	76	
		10/24/2012	0.13	F /	71	
		1/31/2013	0.26	F /	78	
		1/31/2013 (DUP)	0.42	F /	79	
		4/9/2013	0.23	F /	80	
		7/31/2013	0.06	F / B	79	
		10/15/2013	0.068	F /	69	
		10/21/2014	0.16	F /	68	
		11/19/2014	0.15	F /	71	
		12/16/2014	0.17	F /	70	
		8/19/2015	0.075		67	
		10/26/2015	0.022		72	
		4/25/2016	0.31		84	
		10/5/2016	<0.10		67	
		4/24/2017	0.32		67	
		10/10/2017	0.0084	J /	60	
		4/16/2018	0.29		69	
		10/9/2018	<0.02		52	
			Upgradient			
M13	MW807	5/15/2008	<0.1		190	
		5/15/2008 (DUP)	0.029	F /	190	
		8/19/2008	1.1		54	
		8/19/2008 (DUP)	<0.1		55	
		10/21/2008	0.17		240	
		2/4/2009	<0.10	U / UJ	210	
		5/5/2009	<1.0	U / UJ	200	
		7/29/2009	<0.1		220	
		10/28/2009	<2.0		190	/ J
		1/15/2010	<2.0		210	
		4/14/2010	<2.0		200	
		7/21/2010	<2.0		220	
		10/28/2010	0.22	/ J	230	
		1/27/2011	<1.0		220	/ J
		4/19/2011	<1.0		230	
		7/28/2011	<1.0	/ J	230	
		10/12/2011	<1.0	U / UJ	230	
		2/29/2012	<1.0		230	
		4/16/2012	<1.0	U / UJ	230	
		7/17/2012		U / R	230	
		10/24/2012	<2		230	
		1/31/2013	<1		260	
		4/9/2013	<1		230	
		7/31/2013	<1		230	
		10/15/2013	<1		240	
		10/21/2014	<0.5		250	
		11/19/2014	<1		240	
		12/16/2014	0.063	F /	230	
		8/19/2015	<0.20		240	
		10/26/2015	<0.2		230	
		4/25/2016	<0.1		220	
		10/5/2016	<0.50		190	
		4/24/2017	<0.20		210	
		10/10/2017	0.094	J /	200	
		4/16/2018	<0.02		200	
		10/9/2018	<0.02		250	

TABLE B3

Summary of Analytical Results - Indicator Parameters
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	**Nitrate**		**Sulfate**	
		Units	mg/L		mg/L	
		Project Action Limit[1]	10		400	
		Surface Water RG[2]	NS		500	
Site	**Well**	**Date**	**Result**	**LF/VF**	**Result**	**LF/VF**
M13	***Downgradient***					
	MW126R	5/20/2008	0.047	F /	63	
		8/20/2008	<0.1		<5	
		10/22/2008	0.064	F /	62	
		2/5/2009	<0.10	/ UJ	53	
		5/5/2009	0.15	/ J	53	/ J
		7/28/2009	0.12		53	
		10/29/2009	0.95	/ J	79	/ J
		1/14/2010	<2.0		57	
		4/14/2010	0.83		83	
		4/14/2010 (DUP)	0.87		84	
		7/20/2010	0.39		51	
		10/28/2010	0.98	/ J	60	
		1/28/2011	0.18		61	
		4/19/2011	0.19		57	
		7/28/2011	0.13	/ J	53	
		10/13/2011	0.57		49	
		2/29/2012	0.12		53	
		4/16/2012	0.13		52	
		7/17/2012	0.11	/ J	53	
		10/25/2012	0.16	F /	55	
		1/30/2013	0.072	F /	60	
		4/9/2013	0.089	F /	56	
		7/31/2013	0.07	F / B	47	
		10/15/2013	0.087	F /	50	
		10/21/2014	<0.5		55	
		11/19/2014	0.061	F /	57	
		12/16/2014	<0.5		68	
		8/20/2015	0.76	/ J	130	
		10/26/2015	0.037		78	/ J
		4/25/2016	0.042		61	
		10/5/2016	<0.10	/ UJ	51	/ J
		4/24/2017	0.052	B /	50	
		10/10/2017	<0.1		55[3]	
		4/16/2018	1.4		210	
		10/9/2018	0.02		99	
		(DUP)	<0.02		98	

TABLE B3

Summary of Analytical Results - Indicator Parameters
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	**Nitrate**		**Sulfate**	
		Units	mg/L		mg/L	
		Project Action Limit[1]	10		400	
		Surface Water RG[2]	NS		500	
Site	**Well**	**Date**	**Result**	**LF/VF**	**Result**	**LF/VF**
		Downgradient				
M13	MW362	5/13/2008	0.079	F /	260	
		8/20/2008	<0.1		<5	
		10/22/2008	0.032	F /	310	
		2/5/2009	<0.10		240	
		5/5/2009	<1.0	U / UJ	240	
		7/28/2009	<0.10		260	
		10/29/2009	<2.0		360	
		1/14/2010	<2.0		230	
		1/14/2010 (DUP)	<2.0		220	
		4/14/2010	<2.0		210	
		7/20/2010	<2.0		220	/ J
		10/28/2010	0.21	/ J	250	
		1/28/2011	<2.0		240	
		4/19/2011	<1.0		250	
		7/28/2011		U / R	260	
		10/13/2011	<1.0		260	
		2/29/2012	<1.0		280	
		4/16/2012	<1.0		270	
		4/16/2012	<1.0	U / UJ	270	
		7/17/2012	<1.0	/ J	270	
		10/25/2012	<2		250	
		1/30/2013	0.077	F /	280	
		4/9/2013	<0.5		260	
		4/9/2013 (DUP)	<0.5		260	
		7/31/2013	0.12	F / B	240	
		10/15/2013	<1		260	
		10/15/2013 (DUP)	<1		260	
		10/21/2014	<0.5		270	
		10/21/2014 (DUP)	0.048	F /	260	
		11/19/2014	<0.5		260	
		11/19/2014 (DUP)	<0.5		260	
		12/16/2014	<0.5		260	
		12/16/2014 (DUP)	<0.5		250	
		8/20/2015	<0.20	/ UJ	280	
		8/20/2015 (DUP)	<0.20	/ UJ	270	
		10/26/2015	<0.2		250	
		10/26/2015	<0.2		250	
		4/25/2016	<0.1		270	
		4/25/2016 (DUP)	<0.1		260	
		10/5/2016	<1.0		250	
		10/5/2016 (DUP)	<1.0		250	
		4/24/2017	<0.20		250	
		4/24/2017 (DUP)	<0.20		250	
		10/10/2017	0.068		230[3]	
		10/10/2017 (DUP)	<0.1		240	
		4/16/2018	0.1	/ J	250	
		4/16/2018 (DUP)	0.023	/ J	250	
		10/9/2018	<0.02		270	
		10/9/2018 (DUP)	<0.02		240	

TABLE B3

Summary of Analytical Results - Indicator Parameters
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	**Nitrate**		**Sulfate**	
		Units	mg/L		mg/L	
		Project Action Limit[1]	10		400	
		Surface Water RG[2]	NS		500	
Site	**Well**	**Date**	**Result**	**LF/VF**	**Result**	**LF/VF**
		Downgradient				
M13	MW808	5/15/2008	0.4		140	
		8/19/2008	<0.1		130	
		10/21/2008	0.14		100	
		10/21/2008 (DUP)	0.18		99	
		2/4/2009	<0.10	U / UJ	150	
		2/4/2009 (DUP)	<0.10		150	
		5/4/2009	0.33	/ J	190	
		5/4/2009 (DUP)	2	/ J	180	
		7/29/2009	<0.1		380	
		10/29/2009	<0.10		140	/ J
		1/15/2010	<0.10		94	
		4/13/2010	<0.10		64	
		7/20/2010	<0.10		63	
		7/20/2010 (DUP)	<0.10		65	
		10/29/2010	0.15		92	
		1/27/2011	<0.10		81	/ J
		1/27/2011 (DUP)	0.58	F / U	87	/ J
		4/18/2011	<0.10		230	
		4/18/2011 (DUP)	<0.10		220	
		7/28/2011	0.98		120	
		7/28/2011 (DUP)	0.84	/ J	120	
		10/12/2011	<1.0	U / UJ	160	
		2/29/2012	<0.10		99	
		4/16/2012	<0.10		88	
		7/18/2012	<0.1		160	
		7/18/2012	<0.1		160	
		10/25/2012	<2		140	
		1/30/2013	<0.5		130	
		4/9/2013	3.8		**490**	
		7/31/2013	1.5		200	
		10/15/2013	<0.5		260	
		10/20/2014	0.29	F / J	210	
		11/18/2014	<0.5		190	
		12/15/2014	0.15	F /	270	
		8/19/2015	2.6		77	
		10/26/2015	0.11		280	
		4/25/2016	3.3		140	
		10/5/2016	0.29		68	
		4/24/2017	11		74	
		10/10/2017	0.24		93	
		4/16/2018	16	/ J	140	
		10/9/2018	0.53		220	

TABLE B3

Summary of Analytical Results - Indicator Parameters
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	Nitrate		Sulfate	
		Units	mg/L		mg/L	
		Project Action Limit[1]	10		400	
		Surface Water RG[2]	NS		500	
Site	**Well**	**Date**	**Result**	**LF/VF**	**Result**	**LF/VF**
		Downgradient				
M13	MW809	5/15/2008	<0.1		6	
		8/19/2008	0.21		10	
		10/21/2008	0.16		12	
		2/5/2009	<0.10	U / UJ	10	
		5/5/2009	0.27	/ J	9	/ J
		7/29/2009	0.23		11	
		10/29/2009	0.09	F / J	9	/ J
		10/29/2009 (DUP)	0.13	/ J	9	/ J
		1/15/2010	<0.10		10	
		4/13/2010	0.12		8	
		7/20/2010	0.11		10	
		10/29/2010	0.053	F /	10	
		10/29/2010 (DUP)	0.053	F /	12	/ U
		1/27/2011	<0.10		9	/ J
		4/19/2011	0.067	F /	7	
		7/28/2011	0.14	/ U	8	
		10/12/2011	0.13	/ J	6	
		10/12/2011 (DUP)	0.12	/ J	7	
		2/29/2012	<0.10		6	
		2/29/2012	<0.10		6	
		4/16/2012	0.13	/ J	5	
		7/18/2012	0.15		8	
		10/25/2012	0.14	F /	8	
		10/25/2012	0.11	F /	8	
		1/30/2013	<0.5		8	
		4/9/2013	0.091	F /	9	
		7/31/2013	0.087	F /	8	
		7/31/2013 (DUP)	0.076	F /	8	
		10/15/2013	0.068	F /	8	
		10/20/2014	0.078	F / J	14	/ J
		11/18/2014	0.042	F /	9	
		12/15/2014	<0.5		9	
		8/19/2015	0.43		8	
		10/26/2015	0.023		8	
		4/25/2016	0.044		9	
		10/5/2016	0.033		8	
		4/24/2017	0.036	/ J	6	
		10/10/2017	0.09		8.2	
		4/16/2018	0.067		6.8	
		10/9/2018	0.2		9.5	
	MW811	10/29/2014	<5		260	
		11/19/2014	0.62		220	
		12/16/2014	<0.5		220	
		8/19/2015	<0.20		230	
		10/26/2015	<0.1		190	
		4/25/2016	0.085	J/	180	
		10/5/2016	0.54	/ J	160	
		4/24/2017	0.15	B /	170	
		10/10/2017	0.052	J /	170	
		4/16/2018	0.013	J /	130	
		10/9/2018	0.038		190	
		Upgradient				
M11[4]	MW802	5/15/2008	<0.1		320	
		10/7/2008	0.034	F /	91	
		10/7/2008 (DUP)	0.055	F /	93	
		5/4/2009	<0.10	U / UJ	45	/ J
		10/27/2009	0.13		82	
		4/13/2010	<0.10		51	
		10/28/2010	0.063	F / J	79	
		4/15/2011	0.42		130	
		10/11/2011	0.18	/ UJ	140	
		4/16/2012	0.11		85	
		10/24/2012	0.13	F /	260	
		10/16/2013	0.11	F /	88	
		12/11/2014	0.092	F / B	200	
		10/28/2015	<0.02		93	
		10/6/2016		/ R	58	
		10/9/2017	0.049		62	
		10/2/2018	<0.02		130	
	MW803	10/7/2008	0.77		110	
		5/4/2009	0.82	/ J	91	/ J
		10/27/2009	0.28		87	
		4/13/2010	0.82		91	
		10/28/2010	0.95	/ J	91	
		4/15/2011	1.2		89	
		10/11/2011	1.1	/ J	92	
		10/24/2012	0.99		98	
		10/16/2013	0.95		91	
		12/15/2014	0.81		90	
		10/28/2015	0.91		84	
		10/6/2016	0.89	/ J	66	
		10/9/2017	1		79	
		10/2/2018	0.77		81	

TABLE B3

Summary of Analytical Results - Indicator Parameters
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	**Nitrate**		**Sulfate**	
		Units	mg/L		mg/L	
		Project Action Limit[1]	10		400	
		Surface Water RG[2]	NS		500	
Site	**Well**	**Date**	**Result**	**LF/VF**	**Result**	**LF/VF**
			Downgradient			
M11[4]	MW333	5/12/2008	0.19		66	
		10/6/2008	0.042	F /	68	
		5/5/2009	NA		58	/ J
		10/28/2009	<0.10		46	
		4/13/2010	0.22		59	
		10/28/2010	<0.10		56	
		4/18/2011	0.22		60	
		10/11/2011	0.19	/ UJ	59	
		10/24/2012	0.14	F /	59	
		10/16/2013	0.26	F /	80	
		12/15/2014	0.19	F /	75	
		10/28/2015	0.32		61	
		10/6/2016	0.26		60	
		10/9/2017	0.33		58	
		10/2/2018	0.34		65	
	MW334	5/12/2008	0.09	F /	**530**	
		10/6/2008	0.036	F /	**520**	
		5/5/2009	0.2	/ J	**420**	
		10/28/2009	<0.10		330	/ J
		4/13/2010	<0.10		340	
		10/28/2010	0.066	F / J	340	
		4/18/2011	0.094	F /	300	
		10/11/2011	0.23	/ UJ	250	
		10/11/2011 (DUP)	0.25	/ UJ	260	
		10/24/2012	<0.2		240	
		10/16/2013	<0.5		220	
		12/15/2014	0.22	F /	190	
		10/28/2015	<0.1		190	
		10/6/2016	<0.10		180	
		10/9/2017	0.021		150	
		10/2/2018	<0.02		160	
	MW335	5/13/2008	0.11		**1,300**	
		10/7/2008	0.12		**1,300**	
		10/7/2008 (DUP)	<0.1		**460**	
		5/4/2009	0.21	/ J	**1,100**	
		10/28/2009	<0.10		190	/ J
		4/13/2010	0.36		**890**	
		4/13/2010 (DUP)	0.34		**910**	
		10/28/2010	0.079	F / J	**780**	
		4/15/2011	0.47		**710**	
		10/12/2011	0.28	/ UJ	**750**	
		4/16/2012	0.31		**660**	
		10/24/2012	<0.2		**580**	
		10/16/2013	<0.5		**690**	
		10/16/2013 (DUP)	0.045	F /	**700**	
		12/11/2014	<0.5		**480**	
		12/11/2014 (DUP)	<0.5		**490**	
		10/28/2015	<0.1		**410**	
		10/6/2016	0.12		320	
		10/6/2016 (DUP)	<0.10		320	
		10/9/2017	0.0069	J /	340	
		10/2/2018	<0.02		340	
	MW336	5/13/2008	0.026	F /	400	
		10/7/2008	0.031	F /	**510**	
		5/5/2009	<0.10		**490**	
		5/5/2009 (DUP)	<0.10	/ U	**500**	
		10/27/2009	<0.10		**450**	/ J
		10/27/2009 (DUP)	0.1		**2,100**	/ J
		4/13/2010	0.089	F /	**430**	
		10/28/2010	0.088	F / J	**480**	
		4/18/2011	0.14		400	
		10/12/2011	0.14	/ UJ	**410**	
		4/16/2012	0.12		**410**	
		10/24/2012	0.37		**510**	
		10/24/2012 (DUP)	0.37		**530**	
		10/16/2013	<0.5		**710**	
		12/11/2014	0.1	F / B	340	
		10/28/2015	<0.1	/ UJ	390	
		10/6/2016	<0.10		380	
		10/9/2017	0.044		**430**	
		10/2/2018	<0.02		350	

TABLE B3

Summary of Analytical Results - Indicator Parameters
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	**Nitrate**		**Sulfate**	
		Units	mg/L		mg/L	
		Project Action Limit[1]	10		400	
		Surface Water RG[2]	NS		500	
Site	**Well**	**Date**	**Result**	**LF/VF**	**Result**	**LF/VF**
		Downgradient				
M11[4]	MW804	5/15/2008	<0.1		78	
		10/6/2008	0.088	F /	**520**	
		5/5/2009	<0.10	U / UJ	190	
		10/27/2009	0.11		210	
		4/13/2010	<0.10		140	
		10/28/2010	0.068	F / J	**470**	
		4/15/2011	0.087	F /	190	
		4/15/2011 (DUP)	0.091	F /	190	
		10/11/2011	0.21	/ UJ	320	
		10/24/2012	0.17	F /	**490**	
		10/16/2013	<0.5		**410**	
		12/11/2014	0.092	F / B	240	
		10/28/2015	<0.1		**430**	
		10/6/2016	<0.10		110	
		10/9/2017	0.047		350	
		10/2/2018	<0.02		300	
	MW805	10/6/2008	1.5		**590**	
		5/5/2009	1.1	/ J	**490**	
		10/27/2009	1.4		**510**	/ J
		4/13/2010	0.29		**490**	
		11/2/2010	<0.10		**540**	
		4/15/2011	0.18		**500**	
		10/11/2011	0.21	/ UJ	**470**	
		4/16/2012	0.22		**470**	
		10/24/2012	0.21		**450**	
		10/16/2013	<0.5		**470**	
		12/11/2014	<0.5		**450**	
		10/28/2015	0.15		**470**	
		10/28/2015 (DUP)	0.15		**460**	
		10/6/2016		/ R	**430**	
		10/9/2017	0.042		**430**	
		10/9/2017 (DUP)	0.062		**420**	
		10/2018	<0.02		350	

Notes:

Data since the sampling round conducted immediately prior to the completion of each individual site remedial action are shown.
mg/L = Milligrams per liter.
NS = No standard.
LF/VF = Lab flag/validation flag.
NA = Not analyzed.
DUP = Duplicate.
U = Not detected.
J = Estimated concentration.
R = Rejected data, unusable.
< = Result shows laboratory Method Reporting Limit for non-detected results.
F = Concentration below the reported detection limit.
UJ = Estimated detection limit.
B = Blank contamination.
Bolded result indicates Project Action Limit (RG) exceedance.

Footnotes:

(1) Project Action Limits are the Remedial Goals (RGs) as specified in Table 6-2 of the 1998 Record of Decision. Where no RG is presented in the 1998 Record of Decision, the Project Action Limit is obtained from Illinois Environmental Protection Agency Class II groundwater standards.
(2) The surface water Project Action Limits are obtained from Table 10-1 of the 1998 Record of Decision.
(3) Based on historical results and the duplicate result for MW362, there appears to have been an error in reporting results for MW126R and MW362. Therefore, the reported results have been switched.
(4) Site M11 is sampled only during the Annual round.

B4 - SUMMARY OF HISTORICAL GROUNDWATER RESULTS – VOLATILE ORGANIC COMPOUNDS

TABLE B4

Summary of Analytical Results - Volatile Organic Compounds
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	Acetone		Benzene		Carbon disulfide		Chlorobenzene		Chloromethane		1,1-DCA		1,2-DCA		cis-1,2-DCE		Ethyl Benzene		MethCl		MEK		Naphthalene		PCE		Toluene		1,1,1-TCA		TCE		VC		Xylenes (total)	
		Units	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
		Project Action Limit[1]	NS		25		NS		500		NS		3500		25		200		1,000		NS		NS		NS		25		2,500		1,000		25		25		10,000	
Site	Well	Date	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF
		Upgradient																																				
	MW806	5/15/2008	<10		<1		<5		<1		<1		<1		<1		NA		<1		<1		<10		NA		<1		<1		<1		<1		<1		<2	
		8/19/2008	<10		<1		<5		<1		<1		<1		<1		NA		<1		<1		<10		NA		<1		<1		<1		<1		<1		<2	
		10/21/2008	<10		<1		<5		<1		<1		<1		<1		NA		<1		<1		<10		NA		<1		<1		<1		<1		<1		<2	
		2/4/2009	<5.0	U / UJ	<1.0	U / UJ	<5.0	U / UJ	<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<2.0	
		5/5/2009	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		7/29/2009	<5		<1		<5	U / UJ	<1		<1		<1		<1		<1		<1		<3		<5	U / UJ	<1		<1		<1		<1		<1		<1		<2	
		10/28/2009	<5.0	U / UJ	<1.0		<5.0		<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		1/15/2010	<5.0	U / UJ	<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		4/14/2010	<5.0	U / UJ	<1.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		7/21/2010	<5.0		<1.0		<5.0		<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		10/28/2010	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		1/27/2011	<5.0		<1.0		<5.0		<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	U / UJ	<2.0	
		4/19/2011	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		2.6	F / U	<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		7/28/2011	<5.0		<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/12/2011	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		2/29/2012	<5.0		<1.0		<5.0		<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		4/16/2012	<5.0		<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		7/17/2012		U / R	<1		<5		<1			U / R	<1		<1		<1		<1		<3		<5		<1		<1		<1		<1		<1		<1		<1	
		10/24/2012	<5		<1		<5		<1		<1		<1		<1		<1		<1		<3		<5		<1		<1		<1		<1		<1		<1		<1	
		1/31/2013	<10	U / UJ	<1		<2		<1		<2		<1		<1		<1		<1		0.5	F /	<6	U / UJ	<1		<1		<1		<1		<1		<1.5		<1	
		1/31/2013 (DUP)	<10	U / UJ	<1		<2		<1		<2		<1		<1		<1		<1		0.57	F /	<6	U / UJ	<1		<1		<1		<1		<1		<1.5		<1	
		4/9/2013	<10	U /	<1		<2		<1		<2		<1		<1		<1		<1		<5		<6		<1		<1		<1		<1		<1		<1.5		<1	
		7/31/2013	<10		<1		<2		<1		<2		<1		<1		<1		<1		<5		<6		<1		<1		<1		<1		<1		<1.5		<2	
		10/15/2013	<10		<1		<2		<1		<2		<1		<1		<1		<1		<5		<6		<1		<1		<1		<1		<1		<1.5		<2	
		10/21/2014	<10		<1		<2		<1		<2		<1		<1		<1		<1		<5		<6		<1		<1		<1		<1		<1		<1.5		<2	
		11/19/2014	<10		<1		<2		<1		<2		<1		<1		<1		<1		<5		<6		<1		<1		<1		<1		<1		<1.5		<2	
		12/16/2014	<10		<1		<2		<1		<2		<1		<1		<1		<1		<5		<6		<1		<1		<1		<1		<1		<1.5		<2	
		8/19/2015	<20		<5.0		<5.0		<5.0		<5.0		<5.0		<5.0		<5.0		<5.0		<5.0		<10		<5.0		<5.0		<5.0		<5.0		<5.0		<2.0		<5.0	
		10/26/2015	<20		<5		<5		<5		<5		<5		<5		<5		<5		<5		<10		<5		<5		<5		<5		<5		<2		<5	
		4/25/2016	< 10		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 10		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0	
		10/5/2016	<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		4/24/2017	<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/10/2017	<10		<1		<1		<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
		4/16/2018	<10	/ UJ	<1		<1		<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
		10/9/2018	<10		<1		<1		<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
M13	MW807	5/15/2008	<10		<1		<5		<1		<1		<1		<1		NA		<1		<1		<10		NA		<1		<1		<1		<1		<1		<2	
		5/15/2008 (DUP)	<10		<1		<5		<1		<1		<1		<1		NA		<1		<1		<10		NA		<1		<1		<1		<1		<1		<2	
		8/19/2008	<10		<1		<5		<1		<1		<1		<1		NA		<1		<1		<10		NA		<1		<1		<1		<1		<1		<2	
		8/19/2008 (DUP)	<10		<1		<5		<1		<1		<1		<1		NA		<1		<1		<10		NA		<1		<1		<1		<1		<1		<2	
		10/21/2008	<10		<1		<5		<1		<1		1.3		<1		NA		<1		<1		<10		NA		<1		<1		<1		<1		<1		<2	
		2/4/2009	<5.0	U / UJ	<1.0	U / UJ	<5.0	U / UJ	<1.0	U / UJ	<1.0		1.2		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<2.0	
		5/5/2009	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0	U / UJ	1.5		<1.0		0.79	F /	<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		7/29/2009	<5		<1		<5	U / UJ	<1		<1		1.5		<1		<1		<1		<3		<5	U / UJ	<1		<1		<1		<1		<1		<1		<2	
		10/28/2009	<5.0	U / UJ	<1.0		<5.0		<1.0		<1.0	U / UJ	1.5		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		1/15/2010	<5.0	U / UJ	<1.0		<5.0		<1.0		<1.0		1.5		<1.0		0.76	F /	<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		4/14/2010	<5.0	U / UJ	<1.0		<5.0	U / UJ	<1.0		<1.0		1.6		<1.0		0.66	F /	<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		7/21/2010	<5.0		<1.0		<5.0		<1.0		<1.0	U / UJ	1.6		<1.0		0.85	F /	<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		10/28/2010	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0		1.7		<1.0		0.81	F /	<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		1/27/2011	<5.0		<1.0		<5.0		<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	U / UJ	<2.0	
		4/19/2011	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0	U / UJ	1.6		<1.0		0.94	F /	<1.0		2.6	F / U	<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		7/28/2011	<5.0		<1.0		<5.0		<1.0		<1.0		1.6		<1.0		0.76	F /	<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/12/2011	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0	U / UJ	1.7		<1.0		0.95	F /	<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		2/29/2012	<5.0		<1.0		2.4	F /	<1.0		<1.0	U / UJ	1.4		<1.0		0.79	F /	<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		4/16/2012	<5.0		<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		7/17/2012		U / R	<1		<5		<1			U / R	1.5		<1		1.1		<1		<3		<5		<1		<1		<1		<1		<1		<1		<1	
		10/24/2012	<5		<1		<5		<1		<1		1.5		<1		1		<1		<3		<5		<1		<1		<1		<1		0.23	F /	<1		<1	
		1/31/2013	<10	U / UJ	<1		<2		<1		<2		1.9		<1		1.2		<1		0.52	F /	<6	U / UJ	<1		<1		<1		0.28	F /	0.28	F /	<1.5		<1	
		4/9/2013	<10	U /	<1		<2		<1		<2		1.5		<1		1.1		<1		<5		<6		<1		<1		<1		0.22	F /	0.22	F /	<1.5		<1	
		7/31/2013	<10		<1		<2		<1		<2		1.5		<1		1		<1		<5		<6		<1		<1		<1		<1		0.19	F /	<1.5		<2	
		10/15/2013	<10		<1		<2		<1		<2		1.4		<1	U / UJ	0.88	F /	<1		<5		<6		<1	U / UJ	<1		<1		0.32	F / J	0.22	F /	<1.5		<2	
		10/21/2014	<10		<1		<2		<1		<2		1.5		<1		1.1		<1		<5		<6		<1		<1		<1		<1		0.19	F /	<1.5		<2	
		11/19/2014	<10		<1		<2		<1		<2		1.8		<1		1.3		<1		<5		<6		<1		<1		<1		<1		0.2	F /	<1.5		<2	
		12/16/2014	<10		<1		<2		<1		<2		2		<1		1.4		<1		<5		<6		<1		<1		<1		<1		0.19	F /	<1.5		<2	
		8/19/2015	<20		<5.0		<5.0		<5.0		<5.0		1.8	J	<5.0		1.4	J	<5.0		<5.0		<10		<5.0		<5.0		<5.0		<5.0		<5.0		<2.0		<5.0	
		10/26/2015	<20		<5		<5		<5		<5		1.7	J /	<5		1.4	J /	<5		<5		<10		<5		<5		<5		<5		<5		<2		<5	
		4/25/2016	< 10		< 1.0		< 1.0		< 1.0		< 1.0		1.8		< 1.0		1.3		< 1.0		< 1.0		< 10		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0	
		10/5/2016	<10		<1.0		<1.0		<1.0		<1.0		1.6		<1.0		1.3		<1.0		<1.0		<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		4/24/2017	<10		<1.0		<1.0		<1.0		<1.0		1.5		<1.0		1.4		<1.0		<1.0		<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/10/2017	<10		<1		<1		<1		<1		1.4		<1		1.2		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
		4/16/2018	<10	/ UJ	<1		<1		<1		<1		1.4		<1		1.2		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
		10/9/2018	<10		<1		<1		<1		<1		1.4		<1		1.1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	

TABLE B4

Summary of Analytical Results - Volatile Organic Compounds
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	Acetone		Benzene		Carbon disulfide		Chlorobenzene		Chloromethane		1,1-DCA		1,2-DCA		cis-1,2-DCE		Ethyl Benzene		MethCl		MEK		Naphthalene		PCE		Toluene		1,1,1-TCA		TCE		VC		Xylenes (total)	
		Units	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
		Project Action Limit[1]	NS		25		NS		500		NS		3500		25		200		1,000		NS		NS		NS		25		2,500		1,000		25		25		10,000	
Site	Well	Date	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF
		Downgradient																																				
M13	MW126R	5/20/2008	<10		<1		<5		<1		<1		<1		<1		NA		<1		<1		<10		NA		<1		<1		<1		<1		<1		<2	
		8/20/2008	<10		<1		<5		<1		<1		<1		<1		NA		<1		<1		<10		NA		<1		<1		<1		<1		<1		<2	
		10/22/2008	<10		<1		<5		<1		<1		<1		<1		NA		<1		<1		<10		NA		<1		<1		<1		<1		<1		<2	
		2/5/2009	<5.0	U / UJ	<1.0	U / UJ	<5.0	U / UJ	<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<2.0	
		5/5/2009	<5.0		<1.0		<5.0	U / UJ	<1.0		1.2	/ J	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		7/28/2009	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		10/29/2009	<5.0	U / UJ	<1.0		<5.0		<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		1/14/2010	<5.0	U / UJ	<1.0		<5.0		<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		4/14/2010	<5.0	U / UJ	<1.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		4/14/2010 (DUP)	<5.0	U / UJ	<1.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		7/20/2010	<5.0		<1.0		<5.0		<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		10/28/2010	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		1/28/2011	<5.0		<1.0		<5.0		<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	U / UJ	<2.0	
		4/19/2011	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		2.5	F / U	<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		7/28/2011	<5.0		<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/13/2011	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		2/29/2012	<5.0		<1.0		<5.0		<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		4/16/2012	<5.0		<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		0.23	F /	<1.0		<1.0	
		7/17/2012		U / R	<1		<5		<1			U / R	<1		<1		<1		<1		<3		<5		<1		<1		<1		<1		<1		<1		<1	
		10/25/2012	<5		<1		<5		<1		<1		<1		<1		<1		<1		<3		<5		<1		<1		<1		<1		<1		<1		<1	
		1/30/2013	<10		<1		<2		<1		<2		<1		<1		<1		<1		<5		<6		<1		<1		<1		<1		<1		<1.5		<1	
		4/9/2013	<10	U /	<1		<2		<1		<2		<1		<1		<1		<1		<5		<6		<1		<1		<1		<1		<1		<1.5		<1	
		7/31/2013	<10		<1		<2		<1		<2		<1		<1		<1		<1		<5		<6		<1		<1		<1		<1		<1		<1.5		<2	
		10/15/2013	<10		<1		<2		<1		<2		<1		<1		<1		<1		<5		<6		<1		<1		<1		<1		<1		<1.5		<2	
		10/21/2014	4.1	F / B	<1		<2		<1		<2		<1		<1		<1		<1		<5		<6		<1		<1		<1		<1		<1		<1.5		<2	
		11/19/2014	<10		<1		<2		<1		<2		<1		<1		<1		<1		<5		<6		<1		<1		<1		<1		<1		<1.5		<2	
		12/16/2014	8	F /	<1		<2		<1		<2		<1		<1		<1		<1		<5		<6		<1		<1		<1		<1		<1		<1.5		<2	
		8/20/2015	<20		<5.0		<5.0		<5.0		<5.0		<5.0		<5.0		<5.0		<5.0		<5.0		<10		<5.0		<5.0		<5.0		<5.0		<5.0		<2.0		<5.0	
		10/26/2015	<20		<5		<5		<5		<5		<5		<5		<5		<5		<5		<10		<5		<5		<5		<5		<5		<2		<5	
		4/25/2016	< 10		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 10		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0	
		10/5/2016	<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		4/24/2017	<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/10/2017	<10		<1		<1		<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
		4/16/2018	<10	/ UJ	<1		<1		<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
		10/9/2018	<10		<1		<1		<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
		10/9/2018 (DUP)	<10		<1		<1		<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	

TABLE B4

Summary of Analytical Results - Volatile Organic Compounds
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	Acetone		Benzene		Carbon disulfide		Chlorobenzene		Chloromethane		1,1-DCA		1,2-DCA		cis-1,2-DCE		Ethyl Benzene		MethCl		MEK		Naphthalene		PCE		Toluene		1,1,1-TCA		TCE		VC		Xylenes (total)	
		Units	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
		Project Action Limit[1]	NS		25		NS		500		NS		3500		25		200		1,000		NS		NS		NS		25		2,500		1,000		25		25		10,000	
Site	Well	Date	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF
		Downgradient																																				
M13	MW362	5/13/2008	<10		<1		<5		<1		<1		<1		<1		NA		<1		<1		<10		NA		<1		<1		<1		<1		<1		<2	
		8/20/2008	5.8	F /	<1		<5		<1		<1		<1		<1		NA		<1		<1		<10		NA		<1		<1		<1		<1		<1		<2	
		10/22/2008	<10		<1		<5		<1		<1		<1		<1		NA		<1		<1		<10		NA		<1		<1		<1		<1		<1		<2	
		2/5/2009	<5.0	U / UJ	<1.0	U / UJ	<5.0	U / UJ	<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<2.0	
		5/5/2009	<5.0		<1.0		<5.0	U / UJ	<1.0		1.7	/ J	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		7/28/2009	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		10/29/2009	<5.0	U / UJ	<1.0		<5.0		<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		1/14/2010	<5.0	U / UJ	<1.0		<5.0		<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		1/14/2010 (DUP)	<5.0	U / UJ	<1.0		<5.0		<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		4/14/2010	<5.0	U / UJ	<1.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		7/20/2010	<5.0		<1.0		<5.0		<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		10/28/2010	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0		0.43	F /	<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		1/28/2011	<5.0		<1.0		<5.0		<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	U / UJ	<2.0	
		4/19/2011	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		2.5	F / U	<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		7/28/2011	<5.0		<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/13/2011	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		2/29/2012	<5.0		<1.0		<5.0		<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		4/16/2012	<5.0		<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		4/16/2012 (DUP)	<5.0		<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		7/17/2012		U / R	<1		<5		<1			U / R	<1		<1		<1		<1		<3		<5		<1		<1		<1		<1		<1		<1		<1	
		10/25/2012	<5		<1		<5		<1		<1		<1		<1		<1		<1		<3		<5		<1		<1		<1		<1		<1		<1		<1	
		1/30/2013	<10		<1		<2		<1		<2		0.42	F /	<1		<1		<1		<5		<6		<1		0.23	F /	<1		<1		<1		<1.5		<1	
		4/9/2013	<10		<1		<2		<1		<2		0.4	F /	<1		<1		<1		<5		<6		<1		0.26	F /	<1		<1		<1		<1.5		<1	
		4/9/2013 (DUP)	<10		<1		<2		<1		<2		0.39	F /	<1		<1		<1		<5		<6		<1		0.23	F /	<1		<1		<1		<1.5		<1	
		7/31/2013	<10		<1		<2		<1		<2		0.4	F /	<1		<1		<1		<5		<6		<1		0.21	F /	<1		<1		<1		<1.5		<2	
		10/15/2013	<10		<1		<2		<1		<2		0.45	F /	<1		<1		<1		<5		<6		<1		0.27	F /	<1		<1		<1		<1.5		<2	
		10/15/2013 (DUP)	<10		<1		<2		<1		<2		0.46	F /	<1		0.19	F /	<1		<5		<6		<1		0.26	F /	<1		<1		<1		<1.5		<2	
		10/21/2014	3.7	F / B	<1		<2		<1		<2		0.46	F /	<1		<1		<1		<5		<6		<1		0.27	F /	<1		<1		<1		<1.5		<2	
		10/21/2014 (DUP)	6.5	F / B	<1		<2		<1		<2		0.48	F /	<1		0.16	F /	<1		<5		<6		<1		0.28	F /	<1		0.17	F /	<1		<1.5		<2	
		11/19/2014	<10		<1		<2		<1		<2		0.54	F /	<1		0.17	F /	<1		<5		<6		<1		0.3	F /	<1		0.19	F /	<1		<1.5		<2	
		11/19/2014 (DUP)	<10		<1		<2		<1		<2		0.54	F /	<1		0.18	F /	<1		<5		<6		<1		0.32	F /	<1		0.18	F /	<1		<1.5		<2	
		12/16/2014	<10		<1		<2		<1		<2		0.6	F /	<1		0.21	F /	<1		<5		<6		<1		0.29	F /	<1		0.18	F /	<1		<1.5		<2	
		12/16/2014 (DUP)	<10		<1		<2		<1		<2		0.59	F /	<1		0.21	F /	<1		<5		<6		<1		0.29	F /	<1		0.17	F /	<1		<1.5		<2	
		8/20/2015	<20		<5.0		<5.0		<5.0		<5.0		0.52	J	<5.0		<5.0		<5.0		<5.0		<10		<5.0		<5.0		<5.0		<5.0		<5.0		<2.0		<5.0	
		8/20/2015 (DUP)	<20		<5.0		<5.0		<5.0		<5.0		0.5	J	<5.0		<5.0		<5.0		<5.0		<10		<5.0		0.25	J	<5.0		<5.0		<5.0		<2.0		<5.0	
		10/26/2015	<20		<5		<5		<5		<5		0.6	J /	<5		0.26	J /	<5		<5		<10		<5		0.35	J /	<5		<5		<5		<2		<5	
		10/26/2015 (DUP)	<20		<5		<5		<5		<5		0.62	J /	<5		0.27	J /	<5		<5		<10		<5		0.34	J /	<5		<5		<5		<2		<5	
		4/25/2016	< 10		< 1.0		< 1.0		< 1.0		< 1.0		0.66	J/	< 1.0		< 1.0		< 1.0		< 1.0		< 10		< 1.0		0.30	J/	< 1.0		< 1.0		< 1.0		< 1.0		< 1.0	
		4/25/2016 (DUP)	< 10		< 1.0		< 1.0		< 1.0		< 1.0		0.64	J/	< 1.0		< 1.0		< 1.0		< 1.0		< 10		< 1.0		0.30	J/	< 1.0		< 1.0		< 1.0		< 1.0		< 1.0	
		10/5/2016	<10		<1.0		<1.0		<1.0		<1.0		0.56	J /	<1.0		<1.0		<1.0		<1.0		<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/5/2016 (DUP)	<10		<1.0		<1.0		<1.0		<1.0		0.56	J /	<1.0		<1.0		<1.0		<1.0		<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		4/24/2017	<10		<1.0		<1.0		<1.0		<1.0		0.67	J /	<1.0		<1.0		<1.0		<1.0		<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		4/24/2017 (DUP)	<10		<1.0		<1.0		<1.0		<1.0		0.75	J /	<1.0		<1.0		<1.0		<1.0		<10		<1.0		0.41	J /	<1.0		<1.0		<1.0		<1.0		<1.0	
		10/10/2017	<10		<1		<1		<1		<1		0.64	J /	<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
		10/10/2017 (DUP)	<10		<1		<1		<1		<1		0.59	J /	<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
		4/16/2018	<10	/ UJ	<1		<1		<1		<1		0.64	J /	<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
		4/16/2018 (DUP)	<10	/ UJ	<1		<1		<1		<1		0.64	J /	<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
		10/9/2018	<10		<1		<1		<1		<1		0.7	J /	<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
		10/9/2018 (DUP)	<10		<1		<1		<1		<1		0.78	J /	<1		0.4	J /	<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	

TABLE B4

Summary of Analytical Results - Volatile Organic Compounds
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	Acetone		Benzene		Carbon disulfide		Chlorobenzene		Chloromethane		1,1-DCA		1,2-DCA		cis-1,2-DCE		Ethyl Benzene		MethCl		MEK		Naphthalene		PCE		Toluene		1,1,1-TCA		TCE		VC		Xylenes (total)	
		Units	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
		Project Action Limit[1]	NS		25		NS		500		NS		3500		25		200		1,000		NS		NS		NS		25		2,500		1,000		25		25		10,000	
Site	Well	Date	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF
		Downgradient																																				
M13	MW808	5/15/2008	<10		<1		<5		<1		<1		<1		<1		NA		<1		<1		<10		NA		<1		<1		<1		<1		<1		<2	
		8/19/2008	<10		<1		<5		<1		<1		<1		<1		NA		<1		<1		<10		NA		<1		<1		<1		<1		<1		<2	
		10/21/2008	<10		<1		<5		<1		<1		<1		<1		NA		<1		<1		<10		NA		<1		<1		<1		<1		<1		<2	
		10/21/2008 (DUP)	<10		<1		<5		<1		<1		<1		<1		NA		<1		<1		<10		NA		<1		<1		<1		<1		<1		<2	
		2/4/2009	<5.0	U / UJ	<1.0	U / UJ	<5.0	U / UJ	<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<2.0	
		2/4/2009 (DUP)	<5.0	U / UJ	<1.0	U / UJ	<5.0	U / UJ	<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<2.0	
		5/4/2009	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		5/4/2009 (DUP)	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		7/29/2009	<5		<1		<5	U / UJ	<1		<1		<1		<1		<1		<1		<3		<5	U / UJ	<1		<1		<1		<1		<1		<1		<2	
		10/29/2009	<5.0	U / UJ	<1.0		<5.0		<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		1/15/2010	<5.0	U / UJ	<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		4/13/2010	<5.0		<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		7/20/2010	<5.0		<1.0		<5.0		<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		7/20/2010 (DUP)	<5.0		<1.0		<5.0		<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		10/29/2010	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		1/27/2011	<5.0		<1.0		<5.0		<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	U / UJ	<2.0	
		1/27/2011 (DUP)	<5.0		<1.0		<5.0		<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		2.8	F /	<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	U / UJ	<2.0	
		4/18/2011	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		2.5	F / U	<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		4/18/2011 (DUP)	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		2.7	F / U	<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		7/28/2011	<5.0		<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		7/28/2011 (DUP)	<5.0		<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/12/2011	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		2/29/2012	<5.0		<1.0		<5.0		<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		4/16/2012	<5.0		<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		7/18/2012		U / R	<1		<5		<1			U / R	<1		<1		<1		<1		<3		<5		<1		<1		<1		<1		<1		<1		<1	
		7/18/2012 (DUP)		U / R	<1		<5		<1			U / R	<1		<1		<1		<1		<3		<5		<1		<1		<1		<1		<1		<1		<1	
		10/25/2012	22		<1		<5		<1		<1		<1		<1		<1		<1		<3		<5		<1		<1		<1		<1		<1		<1		<1	
		1/30/2013	7.3	F /	<1		<2		<1		<2		<1		<1		<1		<1		0.34	F /	<6		<1	U / UJ	<1		<1		<1		<1		<1.5		<1	
		4/9/2013	<10	U /	<1		<2		<1		<2		<1		<1		<1		<1		<5		<6		<1		<1		<1		<1		<1		<1.5		<1	
		7/31/2013	<10		<1		<2		<1		<2		<1		<1		<1		<1		<5		<6		<1		<1		<1		<1		<1		<1.5		<2	
		10/15/2013	<10		<1		<2		<1		<2		<1		<1		<1		<1		<5		<6		<1		<1		<1		<1		<1		<1.5		<2	
		10/20/2014	3.6	F / B	<1		<2		<1		<2		<1		<1		<1		<1		<5		<6		<1		<1		<1		<1		<1		<1.5		<2	
		11/18/2014	<10		<1		<2		<1		<2		<1		<1		<1		<1		<5		<6		<1		<1		<1		<1		<1		<1.5		<2	
		12/15/2014	<10		<1		<2		<1		<2		<1		<1		<1		<1		<5		<6		<1		<1		<1		<1		<1		<1.5		<2	
		8/19/2015	1.6	J	<5.0		<5.0		<5.0		<5.0		<5.0		<5.0		<5.0		<5.0		<5.0		<10		<5.0		<5.0		<5.0		<5.0		<5.0		<2.0		0.26	J
		10/26/2015	<20		<5		<5		<5		<5		<5		<5		<5		<5		<5		<10		0.17	J /	<5		<5		<5		<5		<2		<5	
		4/25/2016	< 10		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 10		0.26	J /	< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0	
		10/5/2016	<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		4/24/2017	<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/10/2017	<10		<1		<1		<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
		4/16/2018	<10	/ UJ	<1		<1		<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
		10/9/2018	<10		<1		<1		<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	

TABLE B4

Summary of Analytical Results - Volatile Organic Compounds
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	Acetone		Benzene		Carbon disulfide		Chlorobenzene		Chloromethane		1,1-DCA		1,2-DCA		cis-1,2-DCE		Ethyl Benzene		MethCl		MEK		Naphthalene		PCE		Toluene		1,1,1-TCA		TCE		VC		Xylenes (total)	
		Units	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
		Project Action Limit[1]	NS		25		NS		500		NS		3500		25		200		1,000		NS		NS		NS		25		2,500		1,000		25		25		10,000	
Site	Well	Date	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF
		Downgradient																																				
M13	MW809	5/15/2008	<10		<1		<5		<1		<1		<1		<1		NA		<1		<1		<10		NA		<1		<1		<1		<1		<1		<2	
		8/19/2008	<10		<1		<5		<1		<1		<1		<1		NA		<1		<1		<10		NA		<1		<1		<1		<1		<1		<2	
		10/21/2008	<10		<1		<5		<1		<1		<1		<1		NA		<1		<1		<10		NA		<1		<1		<1		<1		<1		<2	
		2/5/2009	<5.0	U / UJ	<1.0	U / UJ	<5.0	U / UJ	<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<2.0	
		5/5/2009	<5.0		<1.0		<5.0	U / UJ	<1.0		1.1	/ J	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		7/29/2009	<5		<1		<5	U / UJ	<1		<1		<1		<1		<1		<1		<3		<5	U / UJ	<1		<1		<1		<1		<1		<1		<2	
		10/29/2009	<5.0	U / UJ	<1.0		<5.0		<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		10/29/2009 (DUP)	<5.0	U / UJ	<1.0		<5.0		<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		1/15/2010	<5.0	U / UJ	<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		4/13/2010	<5.0		<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		7/20/2010	<5.0		<1.0		<5.0		<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		10/29/2010	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		10/29/2010 (DUP)	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		1/27/2011	<5.0		<1.0		<5.0		<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		2.4	F /	<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	U / UJ	<2.0	
		4/19/2011	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		2.6	F / U	<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		7/28/2011	<5.0		<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/12/2011	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/12/2011 (DUP)	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		2/29/2012	<5.0		<1.0		<5.0		<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		2/29/2012 (DUP)	<5.0		<1.0		<5.0		<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		4/16/2012	<5.0		<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		7/18/2012		U / R	<1		<5		<1			U / R	<1		<1		<1		<1		<3		<5		<1		<1		<1		<1		<1		<1		<1	
		10/25/2012	<5		<1		<5		<1		<1		<1		<1		<1		<1		<3		<5		<1		<1		<1		<1		<1		<1		<1	
		10/25/2012 (DUP)	<5		<1		<5		<1		<1		<1		<1		<1		<1		<3		<5		<1		<1		<1		<1		<1		<1		<1	
		1/30/2013	2.5	F /	<1		<2		<1		<2		<1		<1		<1		<1		<5		<6		<1	U / UJ	<1		<1		<1		<1		<1.5		<1	
		4/9/2013	<10	U /	<1		<2		<1		<2		<1		<1		<1		<1		<5		<6		<1		<1		<1		<1		<1		<1.5		<1	
		7/31/2013	<10		<1		<2		<1		<2		<1		<1		<1		<1		<5		<6		<1		<1		<1		<1		<1		<1.5		<2	
		7/31/2013 (DUP)	<10		<1		<2		<1		<2		<1		<1		<1		<1		<5		<6		<1		<1		<1		<1		<1		<1.5		<2	
		10/15/2013	<10		<1		<2		<1		<2		<1		<1		<1		<1		<5		<6		<1		<1		<1		<1		<1		<1.5		<2	
		10/20/2014	3.7	F / B	<1		<2		<1		<2		<1		<1		<1		<1		<5		<6		<1		<1		<1		<1		<1		<1.5		<2	
		11/18/2014	<10		<1		<2		<1		<2		<1		<1		<1		<1		<5		<6		<1		<1		<1		<1		<1		<1.5		<2	
		12/15/2014	<10		<1		<2		<1		<2		<1		<1		<1		<1		<5		<6		<1		<1		<1		<1		<1		<1.5		<2	
		8/19/2015	<20		<5.0		<5.0		<5.0		<5.0		<5.0		<5.0		<5.0		<5.0		<5.0		<10		<5.0		<5.0		<5.0		<5.0		<5.0		<2.0		<5.0	
		10/26/2015	<20		<5		<5		<5		<5		<5		<5		<5		<5		<5		<10		<5		<5		<5		<5		<5		<2		<5	
		4/25/2016	< 10		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 10		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0	
		10/5/2016	<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		4/24/2017	<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/10/2017	<10		<1		<1		<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
		4/16/2018	<10	/ UJ	<1		<1		<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
		10/9/2018	<10	/ UJ	<1		<1		<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
	MW811	10/29/2014	<10		<1		<2		<1	U / UJ	<2		<1		<1		<1		<1		<5		<6		<1	U / UJ	<1		0.22	F / J	<1		<1		<1.5		<2	
		11/19/2014	<10		0.25	F /	<2		<1		<2		0.17	F /	<1		<1		<1		<5		<6		<1		<1		<1		<1		<1		<1.5		<2	
		12/16/2014	<10		0.43	F /	<2		<1		<2		0.23	F /	<1		<1		<1		<5		<6		<1		<1		<1		<1		<1		<1.5		<2	
		8/19/2015	<20		<5.0		<5.0		<5.0		<5.0		<5.0		<5.0		<5.0		<5.0		<5.0		<10		<5.0		<5.0		<5.0		<5.0		<5.0		<2.0		<5.0	
		10/26/2015	<20		<5		<5		<5		<5		<5		<5		<5		<5		<5		<10		<5		<5		<5		<5		<5		<2		<5	
		4/25/2016	< 10		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 10		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0		< 1.0	
		10/5/2016	<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		4/24/2017	<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/10/2017	<10		<1		<1		<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
		4/16/2018	<10	/ UJ	<1		<1		<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
		10/9/2018	<10	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<10	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ
		Upgradient																																				
M11[2]	MW802	5/15/2008	<10		<1		<5		<1		<1		<1		<1		NA		<1		<1		<10		NA		<1		<1		<1		<1		<1		<2	
		10/7/2008	<10		<1		<5		<1		<1		<1		<1		NA		<1		<1		<10		NA		<1		<1		<1		<1		<1		<2	
		10/7/2008 (DUP)	<10		<1		<5		<1		<1		<1		<1		NA		<1		<1		<10		NA		<1		<1		<1		<1		<1		<2	
		5/4/2009	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		10/28/2009	<5.0	U / UJ	<1.0		<5.0		<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		4/13/2010	<5.0		<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		10/28/2010	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		4/15/2011	<5		<1		<5		<1		<1		<1		<1		<1		<1		<3		<5		<1		<1		<1		<1		<1		<1		<1	
		10/11/2011	<5.0		<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		4/16/2012	<5.0		<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/24/2012	<5		<1		<5		<1		<1		<1		<1		<1		<1		<3		<5		<1		<1		<1		<1		<1		<1		<1	
		10/16/2013	<10		<1		<2		<1		<2		<1		<1	U / UJ	<1		<1		<5		<6		<1		<1		<1		<1	U / UJ	<1		<1.5		<2	
		12/11/2014	<10		<1		<2		<1		<2		<1		<1		<1		<1		<5		<6		<1		<1		<1		<1		<1		<1.5		<2	
		10/28/2015	<20		<5		<5	/ UJ	<5		<5		<5		<5		<5		<5		<5		<10		<5		<5		<5		<5		<5		<2		<5	
		10/6/2016	<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/9/2017	<10		<1		<1		<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
		10/2/2018	<10	/ UJ	<1		<1		<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	

RJR/rjr/
J:\2028A USACE JOAAP\03.00 Deliverables\03.06 Reports 2018\03.06.03 Annual Report\03.06.03.03 FINAL Annual Report\Parts\Appendix B\Appendix B4 - VOCs.xlsx

TABLE B4

Summary of Analytical Results - Volatile Organic Compounds
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	Acetone		Benzene		Carbon disulfide		Chlorobenzene		Chloromethane		1,1-DCA		1,2-DCA		cis-1,2-DCE		Ethyl Benzene		MethCl		MEK		Naphthalene		PCE		Toluene		1,1,1-TCA		TCE		VC		Xylenes (total)	
		Units	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
		Project Action Limit[1]	NS		25		NS		500		NS		3500		25		200		1,000		NS		NS		NS		25		2,500		1,000		25		25		10,000	
Site	Well	Date	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF
		Upgradient																																				
M11[2]	MW803	10/7/2008	<10		<1		<5		<1		<1		<1		<1		NA		<1		<1		<10		NA		<1		<1		<1		<1		<1		<2	
		5/4/2009	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		10/27/2009	<5.0	U / UJ	<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		4/13/2010	<5.0		<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		10/28/2010	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		4/15/2011	<5	U / UJ	<1		<5		<1		<1		<1		<1		<1		<1		<3		<5		<1		<1		<1		<1		<1		<1		<1	
		10/11/2011	<5.0		<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/24/2012	<5		<1		<5		<1		<1		<1		<1		<1		<1		<3		<5		<1		<1		<1		<1		<1		<1		<1	
		10/16/2013	<10		<1		<2		<1		<2		<1		<1	U / UJ	<1		<1		<5		<6		<1		<1		<1		<1	U / UJ	<1		<1.5		<2	
		12/15/2014	6.4	F /	<1		<2		<1		<2		<1		<1		<1		<1		<5		<6		<1		<1		<1		<1		<1		<1.5		<2	
		10/28/2015	<20		<5		<5	/ UJ	<5		<5		<5		<5		<5		<5		<5		<10		<5		<5		<5		<5		<5		<2		<5	
		10/6/2016	<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/9/2017	<10		<1		<1		<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
		10/2/2018	<10	/ UJ	<1		<1		<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
		Downgradient																																				
	MW333	5/12/2008	<10		<1		<5		<1		<1		<1		<1		NA		<1		<1		<10		NA		<1		<1		<1		<1		<1		<2	
		10/6/2008	<10		<1		<5		<1		<1		<1		<1		NA		<1		<1		<10		NA		<1		<1		<1		<1		<1		<2	
		5/5/2009	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		10/28/2009	<5.0	U / UJ	<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		4/13/2010	<5.0		<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		10/28/2010	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		4/18/2011	<5.0	U / UJ	<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/11/2011	<5.0		<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/24/2012	<5		<1		<5		<1		<1		<1		<1		<1		<1		<3		<5		<1		<1		<1		<1		<1		<1		<1	
		10/16/2013	<10		<1		<2		<1		<2		<1		<1	U / UJ	<1		<1		<5		<6		<1		<1		<1		<1	U / UJ	<1		<1.5		<2	
		12/15/2014	<10		<1		<2		<1		<2		<1		<1		<1		<1		<5		<6		<1		<1		<1		<1		<1		<1.5		<2	
		10/28/2015	<20		<5		<5	/ UJ	<5		<5		<5		<5		<5		<5		<5		<10		<5		<5		<5		<5		<5		<2		<5	
		10/6/2016	<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/9/2017	<10		<1		<1		<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
		10/2/2018	<10	/ UJ	<1		<1		<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
	MW334	5/12/2008	<10		<1		<5		<1		<1		<1		<1		NA		<1		<1		<10		NA		<1		<1		<1		<1		<1		<2	
		10/6/2008	<10		<1		<5		<1		<1		<1		<1		NA		<1		<1		<10		NA		<1		<1		<1		<1		<1		<2	
		5/5/2009	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		10/28/2009	<5.0	U / UJ	<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		4/13/2010	<5.0		<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		10/28/2010	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		4/18/2011	<5.0	U / UJ	<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/11/2011	<5.0		<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/11/2011 (DUP)	<5.0		<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/24/2012	<5		<1		<5		<1		<1		<1		<1		<1		<1		<3		<5		<1		<1		<1		<1		<1		<1		<1	
		10/16/2013	<10		<1		<2		<1		<2		<1		<1	U / UJ	<1		<1		<5		<6		<1		<1		<1		<1	U / UJ	<1		<1.5		<2	
		12/15/2014	<10		<1		<2		<1		<2		<1		<1		<1		<1		<5		<6		<1		<1		<1		<1		<1		<1.5		<2	
		10/28/2015	<20		<5		<5	/ UJ	<5		<5		<5		4.2	J /	<5		<5		<5		<10		<5		<5		<5		<5		<5		<2		<5	
		10/6/2016	<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/9/2017	2	J / U	<1		0.67	J / U	<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
		10/2/2018	<10	/ UJ	<1		<1		<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
	MW335	5/13/2008	<10		<1		<5		<1		<1		<1		<1		NA		<1		<1		<10		NA		<1		<1		<1		<1		<1		<2	
		10/7/2008	<10		<1		<5		<1		<1		<1		<1		NA		<1		<1		<10		NA		<1		<1		<1		<1		<1		<2	
		10/7/2008 (DUP)	<10		<1		<5		<1		<1		<1		<1		NA		<1		<1		<10		NA		<1		<1		<1		<1		<1		<2	
		5/4/2009	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		10/28/2009	<5.0	U / UJ	<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		4/13/2010	<5.0		<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		4/13/2010 (DUP)	<5.0		<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		10/28/2010	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		4/15/2011	<5	U / UJ	<1		<5		<1		<1		<1		<1		<1		<1		<3		<5		<1		<1		<1		<1		<1		<1		<1	
		10/12/2011	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		4/16/2012	<5.0		<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/24/2012	<5		<1		<5		<1		<1		<1		<1		<1		<1		<3		<5		<1		<1		<1		<1		<1		<1		<1	
		10/16/2013	<10		<1		<2		<1		<2		<1		<1	U / UJ	<1		<1		<5		<6		<1		<1		<1		<1	U / UJ	<1		<1.5		<2	
		10/16/2013 (DUP)	<10		<1		<2		<1		<2		<1		<1	U / UJ	<1		<1		<5		<6		<1		<1		<1		<1	U / UJ	<1		<1.5		<2	
		12/11/2014	<10		<1		<2		<1		<2		<1		<1		<1		<1		<5		<6		<1		<1		<1		<1		<1		<1.5		<2	
		12/11/2014 (DUP)	<10		<1		<2		<1		<2		<1		<1		<1		<1		<5		<6		<1		<1		<1		<1		<1		<1.5		<2	
		10/28/2015	<20		<5		0.5	J / J	<5		<5		<5		<5		<5		<5		<5		<10		<5		<5		<5		<5		<5		<2		<5	
		10/6/2016	<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/6/2016 (DUP)	<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/9/2017	<10		<1		0.63	J / U	<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
		10/2/2018	<10	/ UJ	<1		<1		<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	

TABLE B4

Summary of Analytical Results - Volatile Organic Compounds
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	Acetone		Benzene		Carbon disulfide		Chlorobenzene		Chloromethane		1,1-DCA		1,2-DCA		cis-1,2-DCE		Ethyl Benzene		MethCl		MEK		Naphthalene		PCE		Toluene		1,1,1-TCA		TCE		VC		Xylenes (total)	
		Units	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
		Project Action Limit[1]	NS		25		NS		500		NS		3500		25		200		1,000		NS		NS		NS		25		2,500		1,000		25		25		10,000	
Site	Well	Date	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF
		Downgradient																																				
M11[2]	MW336	5/13/2008	<10		<1		<5		<1		<1		<1		<1		NA		<1		<1		<10		NA		<1		<1		<1		<1		<1		<2	
		10/7/2008	<10		<1		<5		<1		<1		<1		<1		NA		<1		<1		<10		NA		<1		<1		<1		<1		<1		<2	
		5/5/2009	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		5/5/2009 (DUP)	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		10/27/2009	<5.0	U / UJ	<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		10/27/2009 (DUP)	<5.0	U / UJ	<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		4/13/2010	<5.0		<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		10/28/2010	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		4/18/2011	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		0.94	F /	<1.0		<1.0		<1.0		<1.0		<1.0	
		10/12/2011	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		4/16/2012	<5.0		<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/24/2012	5.1		<1		<5		<1		<1		<1		<1		<1		<1		<3		<5		<1		<1		<1		<1		<1		<1		<1	
		10/24/2012 (DUP)	5.4		<1		<5		<1		<1		<1		<1		<1		<1		<3		<5		<1		<1		<1		<1		<1		<1		<1	
		10/16/2013	<10		<1		<2		<1		<2		<1		<1	U / UJ	<1		<1		<5		<6		<1		<1		<1		<1	U / UJ	<1		<1.5		<2	
		12/11/2014	3.5	F /	<1		<2		<1		<2		<1		<1		<1		<1		<5		<6		<1		<1		<1		<1		<1		<1.5		<2	
		10/28/2015	<20		<5		<5	/ UJ	<5		<5		<5		<5		<5		<5		<5		<10		<5		<5		<5		<5		<5		<2		<5	
		10/6/2016	<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/9/2017	<10		<1		0.77	J / U	<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
		10/2/2018	<10	/ UJ	<1		<1		<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
	MW804	5/15/2008	<10		<1		<5		<1		<1		<1		<1		NA		<1		<1		<10		NA		<1		<1		<1		<1		<1		<2	
		10/6/2008	<10		<1		<5		<1		<1		<1		<1		NA		<1		<1		<10		NA		<1		<1		<1		<1		<1		<2	
		5/5/2009	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		10/27/2009	<5.0	U / UJ	<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		4/13/2010	<5.0	U / UJ	<1.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		10/28/2010	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		4/15/2011	<5	U / UJ	<1		<5		<1		<1		<1		<1		<1		<1		<3		<5		<1		<1		<1		<1		<1		<1		<1	
		4/15/2011 (DUP)	<5	U / UJ	<1		<5		<1		<1		<1		<1		<1		<1		<3		<5		<1		<1		<1		<1		<1		<1		<1	
		10/11/2011	<5.0		<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/24/2012	<5		<1		<5		<1		<1		<1		<1		<1		<1		<3		<5		<1		<1		<1		<1		<1		<1		<1	
		10/16/2013	<10		<1		<2		<1		<2		<1		<1	U / UJ	<1		<1		<5		<6		<1		<1		<1		<1	U / UJ	<1		<1.5		<2	
		12/11/2014	<10		<1		<2		<1		<2		<1		<1		<1		<1		<5		<6		<1		<1		<1		<1		<1		<1.5		<2	
		10/28/2015	<20		<5		<5	/ UJ	<5		<5		<5		<5		<5		<5		<5		<10		<5		<5		<5		<5		<5		<2		<5	
		10/6/2016	<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/9/2017	<10		<1		1	/ U	<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
		10/2/2018	<10	/ UJ	<1		<1		<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
	MW805	10/6/2008	<10		<1		<5		<1		<1		<1		<1		NA		<1		<1		<10		NA		<1		<1		<1		<1		<1		<2	
		5/5/2009	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		10/27/2009	<5.0	U / UJ	<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		4/13/2010	<5.0	U / UJ	<1.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		11/2/2010	<5.0		<1.0		<5.0	U / UJ	<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<2.0	
		4/15/2011	<5		<1		<5		<1		<1		<1		<1		<1		<1		<3		<5		<1		<1		<1		<1		<1		<1		<1	
		10/11/2011	<5.0		<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		4/16/2012	<5.0		<1.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<3.0		<5.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/24/2012	5.5		<1		<5		<1		<1		<1		<1		<1		<1		<3		<5		<1		<1		<1		<1		<1		<1		<1	
		10/16/2013	<10		<1		<2		<1		<2		<1		<1	U / UJ	<1		<1		<5		<6		<1		<1		<1		<1	U / UJ	<1		<1.5		<2	
		12/11/2014	4.1	F /	<1		<2		<1		<2		<1		<1		<1		<1		<5		<6		<1		<1		<1		<1		<1		<1.5		<2	
		10/28/2015	<20		<5		<5	/ UJ	<5		<5		<5		<5		<5		<5		<5		2.9	J /	<5		<5		<5		<5		<5		<2		<5	
		10/28/2015 (DUP)	<20		<5		<5	/ UJ	<5		<5		<5		<5		<5		<5		<5		<10		<5		<5		<5		<5		<5		<2		<5	
		10/6/2016	<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<10		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0		<1.0	
		10/9/2017	<10		<1		0.63	J / U	<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
		10/9/2017 (DUP)	<10		<1		0.63	J / U	<1		<1		<1		<1		<1		<1		<1		<10		<1		<1		<1		<1		<1		<1		<1	
		10/2/2018	<10	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<10	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ	<1	/ UJ

Notes:

Data since the sampling round conducted immediately prior to the completion of each individual site remedial action are shown.
An abbreviated list of compounds analyzed is used for reporting based on historically detected and reported compounds.
µg/L = Micrograms per liter.
NS = No standard.
LF/VF = Lab flag/validation flag.
< = Result shows laboratory method reporting limit for non-detected results.
NA = Not analyzed.
U = Not detected.
UJ = Not detected, estimated detection limit.
R = Rejected data, unusable.
F = Concentration below the reported detection limit.
DUP = Duplicate.
J = Estimated concentration.
B = Blank contamination.
Bolded result indicates Project Action Limit (RG) exceedance.

1,1-DCA = 1,1-Dichloroethane.
1,2-DCA = 1,2-Dichloroethane.
cis-1,2-DCE = cis-1,2-Dichloroethene.
1,2-DCA (tot) = Total 1,2-dichloroethane.
MethCl = Methylene chloride.
MEK = Methyl ethyl ketone (2-butanone).
PCE = Tetrachloroethene.
1,1,1-TCA = 1,1,1-Trichloroethane.
TCE = Trichloroethene.
VC = Vinyl chloride.

Footnotes:

(1) Project Action Limits are the Remedial Goals (RGs) as specified in Table 6-2 of the 1998 Record of Decision. Where no RG is presented in the 1998 Record of Decision, the Project Action Limit is obtained from Illinois Environmental Protection Agency Class II groundwater standards.
(2) Site M11 is sampled only during Annual round.

B5 - SUMMARY OF HISTORICAL GROUNDWATER RESULTS – SEMIVOLATILE ORGANIC COMPOUNDS

TABLE B5

Summary of Analytical Results - Semivolatile Organic Compounds
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	2,4-DNT		2,6-DNT		NB		Phenol		Naphthalene		2-Methylnaphthalene	
		Units	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
		Project Action Limit[1]	0.42		0.42		51		NS		NS		NS	
Site	Well	Date	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF
							Upgradient							
	MW806	5/15/2008	<0.95		<0.48		<1.4		<4.8		<0.95		<0.48	
		8/19/2008	<0.94		<0.47		<1.4		<4.7		<0.94		<0.47	
		10/21/2008	<1		<0.5		<1.5		<5		<1		<0.5	
		2/4/2009	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		5/5/2009	<1.3		<0.47		<0.93		8.2		<0.93		<0.47	
		7/29/2009	<1.3	U / UJ	<0.47		<0.93		<4.7		<0.93		<0.47	
		10/28/2009	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		1/15/2010	<1.3		0.23	F /	<0.94		<4.7		<0.94		<0.47	
		4/14/2010	<1.3	U / UJ	<0.47	U / UJ	<0.93		<4.7		<0.93		<0.47	
		7/21/2010	<1.3		<0.47		<0.93		<4.7		0.64	F /	<0.47	
		10/28/2010	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		1/27/2011	<1.4		<0.50		<1.0		<5.0		<1.0		<0.50	U / UJ
		4/19/2011	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		7/28/2011	<1.4		<0.51		<1.0		<5.1		<1.0		<0.51	
		10/12/2011	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		2/29/2012	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	U / UJ
		4/16/2012	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	U / UJ
		7/17/2012	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		10/24/2012	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		1/31/2013	<19		<19		<19		<9.5		<9.5		<9.5	
		1/31/2013 (DUP)	<19		<19		<19		<9.5		<9.5		<9.5	
		4/9/2013	<19		<19		<19		<9.5		<9.5		<9.5	
		7/31/2013	<19		<19		<19		<9.5		<9.5		<9.5	
		10/15/2013	<19		<19		<19		<9.5		<9.5		<9.5	
		10/21/2014	<19		<19		<19		<9.5		<9.5		<9.5	
		11/19/2014	<19		<19		<19		<9.5		<9.5		<9.5	
		12/16/2014	<19		<19		<19		<9.5		<9.5		<9.5	
		8/19/2015	<2.0		<2.0		<1.0		<1.0		<1.0		NA	
		10/26/2015	<2		<2		<1		<1		<1		NA	
		4/25/2016	< 2.0		< 2.0		< 1.0		< 1.0		< 1.0		NA	
		10/5/2016	<2.0		<2.0		<1.0		<1.0		<1.0		NA	
		4/24/2017	<1.6		<1.6		<0.80		<0.80	/ UJ	<0.80		NA	
		10/10/2017	<1.6	/ UJ	<1.6	/ UJ	<0.8	/ UJ	<0.8		<0.8	/ UJ	NA	
		4/16/2018	<1.6	/ UJ	<1.6		<0.8		<0.8	/ UJ	<0.8		NA	
		10/9/2018	<1.6		<1.6		<0.8		<0.8	/ UJ	<0.8		NA	
M13	MW807	5/15/2008	<0.99		<0.5		<1.5		<5		<0.99		<0.5	
		5/15/2008 (DUP)	<0.95		<0.48		<1.4		<4.8		<0.95		<0.48	
		8/19/2008	<0.94		<0.47		<1.4		<4.7		<0.94		<0.47	
		8/19/2008 (DUP)	<0.94		<0.47		<1.4		<4.7		<0.94		<0.47	
		10/21/2008	<0.93		<0.47		<1.4		<4.7		<0.93		<0.47	
		2/4/2009	<1.3		<0.47		<0.93		<4.7		0.49	F /	1.4	
		5/5/2009	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		7/29/2009	<1.3	U / UJ	<0.47		<0.93		<4.7		<0.93		<0.47	
		10/28/2009	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		1/15/2010	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		4/14/2010	<1.3	U / UJ	<0.47	U / UJ	<0.93		<4.7		<0.93		<0.47	
		7/21/2010	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		10/28/2010	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		1/27/2011	<1.4		<0.50		<1.0		<5.0		<1.0		<0.50	U / UJ
		4/19/2011	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		7/28/2011	<1.4	U / UJ	<0.49	U / UJ	<0.98	U / UJ	<4.9		<0.98	U / UJ	<0.49	U / UJ
		10/12/2011	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		2/29/2012	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	U / UJ
		4/16/2012	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	U / UJ
		7/17/2012	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		10/24/2012	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		1/31/2013	<19		<19		<19		<9.5		<9.5		<9.5	
		4/9/2013	<19		<19		<19		<9.5		<9.5		<9.5	
		7/31/2013	<19		<19		<19		<9.5		<9.5		<9.5	
		10/15/2013	<19		<19		<19		<9.4		<9.4		<9.4	
		10/21/2014	<23		<23		<23		<12		<12		<12	
		11/19/2014	<19		<19		<19		<9.5		<9.5		<9.5	
		12/16/2014	<19		<19		<19		<9.6		<9.6		<9.6	
		8/19/2015	<2.0		<2.0		<1.0		<1.0		<1.0		NA	
		10/26/2015	<2		<2		<1		<1		<1		NA	
		4/25/2016	< 2.0		< 2.0		< 1.0		< 1.0		< 1.0		NA	
		10/5/2016	<2.0		<2.0		<1.0		<1.0		<1.0		NA	
		4/24/2017	<1.6		<1.6		<0.80		<0.80	/ UJ	<0.80		NA	
		10/10/2017	<1.6		<1.6		<0.8		<0.8		<0.8		NA	
		4/16/2018	<1.6	/ UJ	<1.6		<0.8		<0.8	/ UJ	<0.8		NA	
		10/9/2018	<1.6		<1.6		<0.8		<0.8	/ UJ	<0.8		NA	

TABLE B5

Summary of Analytical Results - Semivolatile Organic Compounds
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	**2,4-DNT**		**2,6-DNT**		**NB**		**Phenol**		**Naphthalene**		**2-Methylnaphthalene**	
		Units	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
		Project Action Limit[1]	0.42		0.42		51		NS		NS		NS	
Site	**Well**	**Date**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**
		Downgradient												
	MW126R	5/20/2008	<0.93		<0.47		<1.4		<4.7		<0.93		<0.47	
		8/20/2008	<0.94		<0.47		<1.4		<4.7		<0.94		<0.47	
		10/22/2008	<0.99		<0.5		<1.5		<5		<0.99		<0.5	
		2/5/2009	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		5/5/2009	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		7/28/2009	<1.3	U / UJ	<0.47		<0.93		<4.7		<0.93		<0.47	
		10/29/2009	<1.3		<0.47		<0.94		<4.7		<0.94		<0.47	
		1/14/2010	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		4/14/2010	<1.3	U / UJ	<0.47	U / UJ	<0.93		<4.7		<0.93		<0.47	
		4/14/2010 (DUP)	<1.3	U / UJ	<0.47	U / UJ	<0.93		<4.7		<0.93		<0.47	
		7/20/2010	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		10/28/2010	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		1/28/2011	<1.4		<0.52		<1.0		<5.2		<1.0		<0.52	
		4/19/2011	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		7/28/2011	<1.4		<0.50		<0.99		<5.0		<0.99		<0.50	
		10/13/2011	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		2/29/2012	<1.3		<0.48		<0.95		<4.8		<0.95		<0.48	U / UJ
		4/16/2012	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	U / UJ
		7/17/2012	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		10/25/2012	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		1/30/2013	<19		<19		<19		<9.6		<9.6		<9.6	
		4/9/2013	<19		<19		<19		<9.5		<9.5		<9.5	
		7/31/2013	<19		<19		<19		<9.4		<9.4		<9.4	
		10/15/2013	<19		<19		<19		<9.5		<9.5		<9.5	
		10/21/2014	<19		<19		<19		<9.5		<9.5		<9.5	
		11/19/2014	<19		<19		<19		<9.5		<9.5		<9.5	
		12/16/2014	<19		<19		<19		<9.5		<9.5		<9.5	
		8/20/2015	<2.0		<2.0		<1.0		<1.0		<1.0		NA	
		10/26/2015	<2		<2		<1		<1		<1		NA	
		4/25/2016	< 2.0		< 2.0		< 1.0		< 1.0		< 1.0		NA	
		10/5/2016	<2.0		<2.0		<1.0		<1.0		<1.0		NA	
		4/24/2017	<1.6	/ UJ	<1.6	/ UJ	<0.80	/ UJ	<0.80	/ UJ	<0.80		NA	
		10/10/2017	<1.6	/ UJ	<1.6	/ UJ	<0.8	/ UJ	<0.8	/ UJ	<0.8	/ UJ	NA	
		4/16/2018	<1.6	/ UJ	<1.6		<0.8		<0.8	/ UJ	<0.8		NA	
		10/9/2018	<1.6		<1.6		<0.8		<0.8	/ UJ	<0.8		NA	
		10/9/2018 (DUP)	<1.6		<1.6		<0.8		<0.8	/ UJ	<0.8		NA	
M13	MW362	5/13/2008	<0.98		<0.49		<1.5		<4.9		<0.98		<0.49	
		8/20/2008	<0.95		<0.48		<1.4		<4.8		<0.95		<0.48	
		10/22/2008	<0.97		<0.49		<1.5		<4.9		<0.97		<0.49	
		2/5/2009	**2.2**		0.2	F /	<0.93		<4.7		<0.93		<0.47	
		5/5/2009	<1.3		0.19	F /	<0.93		<4.7		<0.93		<0.47	
		7/28/2009	**1.3**	F / J	<0.47		<0.93		<4.7		<0.93		<0.47	
		10/29/2009	**2.3**		<0.47		<0.93		<4.7		<0.93		<0.47	
		1/14/2010	**3.8**		0.32	F /	<0.93		<4.7		<0.93		<0.47	
		1/14/2010 (DUP)	**3.6**		0.35	F /	<0.93		<4.7		<0.93		<0.47	
		4/14/2010	<1.3	U / UJ	<0.47	U / UJ	<0.93		<4.7		<0.93		<0.47	
		7/20/2010	**2.2**		**0.55**		<0.93		<4.7		<0.93		<0.47	
		10/28/2010	**5.7**		<0.47		<0.93		<4.7		<0.93		<0.47	
		1/28/2011	**7.1**		<0.52		<1.0		<5.2		0.17	F /	<0.52	
		4/19/2011	**1.7**		<0.47		<0.93		<4.7		<0.93		<0.47	
		7/28/2011	**0.95**	F /	0.2	F /	<1.1		<5.4		<1.1		<0.54	
		10/13/2011	**1.9**		<0.47		<0.93		<4.7		<0.93		<0.47	
		2/29/2012	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	U / UJ
		4/16/2012	**3.3**		0.25	F /	<0.93		<4.7		<0.93		<0.47	U / UJ
		4/16/2012	**2.6**		0.29	F /	<0.93		<4.7		<0.93		<0.47	U / UJ
		7/17/2012	**2.8**		0.29	F /	<0.93		<4.7		<0.93		<0.47	
		10/25/2012	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		1/30/2013	**4.3**	F /	<19		<19		<9.5		<9.5		<9.5	
		4/9/2013	**1.8**	F /	<19		<19		<9.5		<9.5		<9.5	
		4/9/2013 (DUP)	**1.7**	F /	<19		<19		<9.5		<9.5		<9.5	
		7/31/2013	<19		<19		<19		<9.5		<9.5		<9.5	
		10/15/2013	**5.4**	F /	<19		<19		<9.5		<9.5		<9.5	
		10/15/2013 (DUP)	**5.7**	F /	<19		<19		<9.5		<9.5		<9.5	
		10/21/2014	**3.4**	F /	<19		<19		<9.5		<9.5		<9.5	
		10/21/2014 (DUP)	**2.9**	F /	<19		<19		<9.7		<9.7		<9.7	
		11/19/2014	**4.4**	F /	<19		<19		<9.5		<9.5		<9.5	
		11/19/2014 (DUP)	**4.8**	F /	<19		<19		<9.5		<9.5		<9.5	
		12/16/2014	**4.8**	F /	<20		<20		<10		<10		<10	
		12/16/2014 (DUP)	**4.7**	F /	<19		<19		<9.6		<9.6		<9.6	
		8/20/2015	**3.9**		<2.0		<1.0		<1.0		<1.0		NA	
		8/20/2015 (DUP)	**3.5**		<2.0		<1.0		<1.0		<1.0		NA	
		10/26/2015	**6.5**		0.4	J /	<1		<1		<1		NA	
		10/26/2015 (DUP)	**6**		0.42	J /	<1		<1		<1		NA	
		4/25/2016	**2.5**	/ J	< 2.0	/ UJ	< 1.0	/ UJ	< 1.0		< 1.0	/ UJ	NA	
		4/25/2016 (DUP)	**2.8**		< 2.0		< 1.0		< 1.0		< 1.0		NA	
		10/5/2016	**2.7**		<2.0		<1.0		<1.0		<1.0		NA	
		10/5/2016 (DUP)	**2.6**		<2.0		<1.0		<1.0		<1.0		NA	
		4/24/2017	**2.3**		<1.6		<0.80		<0.80	/ UJ	<0.80		NA	
		4/24/2017 DUP	**2.1**		<1.6		<0.80		<0.80	/ UJ	<0.80		NA	
		10/10/2017	**2.1**	/ J	<1.6	/ UJ	<0.8	/ UJ	<0.8		<0.8	/ UJ	NA	
		10/10/2017 DUP	**3.7**		<1.6		<0.8		<0.8		<0.8		NA	
		4/16/2018	**2.6**	/ J	<1.6		<0.8		<0.8	/ UJ	<0.8		NA	
		4/16/2018 (DUP)	**3**	/ J	<1.6		<0.8		<0.8	/ UJ	<0.8		NA	
		10/9/2018	**3.2**		<1.6		<0.8		<0.8	/ UJ	<0.8		NA	
		10/9/2018 (DUP)	**3.6**		<1.6		<0.8		<0.8	/ UJ	<0.8		NA	

TABLE B5

Summary of Analytical Results - Semivolatile Organic Compounds
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	2,4-DNT		2,6-DNT		NB		Phenol		Naphthalene		2-Methylnaphthalene	
		Units	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
		Project Action Limit[1]	0.42		0.42		51		NS		NS		NS	
Site	Well	Date	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF
							Downgradient							
M13	MW808	5/15/2008	<0.95		<0.48		<1.4		<4.8		<0.95		<0.48	
		8/19/2008	<0.98		<0.49		<1.5		<4.9		<0.98		<0.49	
		10/21/2008	<0.98		<0.49		<1.5		<4.9		<0.98		<0.49	
		10/21/2008 (DUP)	<0.99		<0.5		<1.5		<5		<0.99		<0.5	
		2/4/2009	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		2/4/2009 (DUP)	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		5/4/2009	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		5/4/2009 (DUP)	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		7/29/2009	<1.3	U / UJ	<0.47		<0.93		<4.7		<0.93		<0.47	
		10/29/2009	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		1/15/2010	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		4/13/2010	<1.3	U / UJ	<0.47	U / UJ	<0.93		<4.7		<0.93		<0.47	
		7/20/2010	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		7/20/2010 (DUP)	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		10/29/2010	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		1/27/2011	<1.5		<0.54		<1.1		<5.4		<1.1		<0.54	U / UJ
		1/27/2011 (DUP)	<1.4		<0.51		<1.0		<5.1		<1.0		<0.51	U / UJ
		4/18/2011	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		4/18/2011 (DUP)	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		7/28/2011		U / R		U / R		U / R		U / R		U / R		U / R
		7/28/2011 (DUP)		U / R		U / R		U / R		U / R		U / R		U / R
		10/12/2011	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		2/29/2012	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	U / UJ
		4/16/2012	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	U / UJ
		7/18/2012	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		7/18/2012	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		10/25/2012	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		1/30/2013	<19		<19		<19		<9.5		<9.5		<9.5	
		4/9/2013	<19		<19		<19		<9.5		<9.5		<9.5	
		7/31/2013	<19		<19		<19		<9.5		<9.5		<9.5	
		10/15/2013	<19		<19		<19		<9.5		<9.5		<9.5	
		10/20/2014	<19		<19		<19		<9.6		<9.6		<9.6	
		11/18/2014	<19		<19		<19		<9.5		<9.5		<9.5	
		12/15/2014	<19		<19		<19		<9.7		<9.7		<9.7	
		8/19/2015	<2.0		<2.0		<1.0		<1.0		<1.0		NA	
		10/26/2015	<2		<2		<1		<1		<1		NA	
		4/25/2016	< 2.0	/ UJ	< 2.0	/ UJ	< 1.0	/UJ	< 1.0		< 1.0	/ UJ	NA	
		10/5/2016	<2.0		<2.0		<1.0		<1.0		<1.0		NA	
		4/24/2017	<1.6		<1.6		<0.80		<0.80	/ UJ	<0.80		NA	
		10/10/2017	<1.6		<1.6		<0.8		<0.8		<0.8		NA	
		4/16/2018	<1.6	/ UJ	<1.6		<0.8		<0.8	/ UJ	<0.8		NA	
		10/9/2018	<1.6		<1.6		<0.8		<0.8	/ UJ	<0.8		NA	
	MW809	5/15/2008	<0.95		<0.48		<1.4		<4.8		<0.95		<0.48	
		8/19/2008	<0.94		<0.47		<1.4		<4.7		<0.94		<0.47	
		10/21/2008	<0.98		<0.49		<1.5		<4.9		<0.98		<0.49	
		2/5/2009	<1.3		<0.47		<0.93		<4.7		<0.93		0.16	F /
		5/5/2009	<1.3		<0.47		<0.93	U / UJ	<4.7		<0.93		<0.47	
		7/29/2009	<1.3	U / UJ	<0.47		<0.93		<4.7		<0.93		<0.47	
		10/29/2009	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		10/29/2009 (DUP)	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		1/15/2010	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		4/13/2010	<1.3	U / UJ	<0.47	U / UJ	<0.93		<4.7		<0.93		<0.47	
		7/20/2010	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		10/29/2010	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		10/29/2010 (DUP)	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		1/27/2011	<1.4		<0.51		<1.0		<5.1		<1.0		<0.51	U / UJ
		4/19/2011	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		7/28/2011	<1.3	U / UJ	<0.47	U / UJ	<0.93	U / UJ	<4.7		<0.93	U / UJ	<0.47	U / UJ
		10/12/2011	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		10/12/2011 (DUP)	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		2/29/2012	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	U / UJ
		2/29/2012 (DUP)	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	U / UJ
		4/16/2012	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	U / UJ
		7/18/2012	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		10/25/2012	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		10/25/2012 (DUP)	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		1/30/2013	<19		<19		<19		<9.4		<9.4		<9.4	
		4/9/2013	<19		<19		<19		<9.5		<9.5		<9.5	
		7/31/2013	<19		<19		<19		<9.4		<9.4		<9.4	
		7/31/2013 (DUP)	<19		<19		<19		<9.5		<9.5		<9.5	
		10/15/2013	<19		<19		<19		<9.5		<9.5		<9.5	
		10/20/2014	<19		<19		<19		<9.5		<9.5		<9.5	
		11/18/2014	<19		<19		<19		<9.5		<9.5		<9.5	
		12/15/2014	<19		<19		<19		<9.5		<9.5		<9.5	
		8/19/2015	<2.0		<2.0		<1.0		<1.0		<1.0		NA	
		10/26/2015	<2		<2		<1		<1		<1		NA	
		4/25/2016	< 2.0	/ UJ	< 2.0	/ UJ	< 1.0	/ UJ	< 1.0		< 1.0	/ UJ	NA	
		10/5/2016	<2.0		<2.0		<1.0		<1.0		<1.0		NA	
		4/24/2017	<1.6	/ UJ	<1.6	/ UJ	<0.80	/ UJ	<0.80	/ UJ	<0.80	/ UJ	NA	
		10/10/2017	<1.6		<1.6		<0.8		<0.8		<0.8		NA	
		4/16/2018	<1.6	/ UJ	<1.6		<0.8		<0.8	/ UJ	<0.8		NA	
		10/9/2018	<1.6		<1.6		<0.8		<0.8	/ UJ	<0.8		NA	

TABLE B5

Summary of Analytical Results - Semivolatile Organic Compounds
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	2,4-DNT		2,6-DNT		NB		Phenol		Naphthalene		2-Methylnaphthalene	
		Units	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
		Project Action Limit[1]	0.42		0.42		51		NS		NS		NS	
Site	Well	Date	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF	Result	LF/VF
							Downgradient							
M13	MW811	10/29/2014	<19		<19		<19		<9.6		<9.6		<9.6	
		11/19/2014	<21		<21		<21		<11		<11		<11	
		12/16/2014	<19		<19		<19		<9.5		<9.5		<9.5	
		8/19/2015	<2.0		<2.0		<1.0		<1.0		<1.0		NA	
		10/26/2015	<2		<2		<1		<1		<1		NA	
		4/25/2016	< 2.0		< 2.0		< 1.0		< 1.0		< 1.0		NA	
		10/5/2016	<2.0		<2.0		<1.0		<1.0		<1.0		NA	
		4/24/2017	<1.6		<1.6		<0.80		<0.80	/ UJ	<0.80		NA	
		10/10/2017	<1.6		<1.6		<0.8		<0.8		<0.8		NA	
		4/16/2018	<1.6	/ UJ	<1.6		<0.8		<0.8	/ UJ	<0.8		NA	
		10/9/2018	<1.6		<1.6		<0.8		<0.8	/ UJ	<0.8		NA	
							Upgradient							
M11[2]	MW802	5/15/2008	<0.95		<0.48		<1.4		<4.8		<0.95		<0.48	
		10/7/2008	<0.95		<0.48		<1.4		<4.8		<0.95		<0.48	
		10/7/2008 (DUP)	<0.96		<0.48		<1.4		<4.8		<0.96		<0.48	
		5/4/2009	<1.3		<0.48		<0.95		<4.8		<0.95		<0.48	
		10/27/2009	<1.3		<0.47		<0.93	U / UJ	<4.7	U / UJ	<0.93		<0.47	
		4/13/2010	<1.3	U / UJ	<0.47	U / UJ	<0.93		<4.7		<0.93		<0.47	
		10/28/2010	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		4/15/2011	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		10/11/2011	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		4/16/2012	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	U / UJ
		10/24/2012	<1.4		<0.51		<1		<5.1		<1		<0.51	
		10/16/2013	<20		<20		<20		<9.9		<9.9		<9.9	
		12/11/2014	<19		<19		<19		<9.7		<9.7		<9.7	
		10/28/2015	<2		<2		<1		<1		<1		NA	
		10/6/2016	<2.0		<2.0		<1.0		<1.0		<1.0		NA	
		10/9/2017	<1.6		<1.6		<0.8		<0.8		<0.8		NA	
		10/2/2018	<1.6		<1.6		<0.8		<0.8		<0.8		NA	
	MW803	10/7/2008	<0.93		<0.47		<1.4		<4.7		<0.93		<0.47	
		5/4/2009	<1.3		<0.47		<0.94		<4.7		<0.94		<0.47	
		10/27/2009	<1.3		<0.47		<0.94	U / UJ	<4.7	U / UJ	<0.94		<0.47	
		4/13/2010	<1.3	U / UJ	<0.47	U / UJ	<0.93		<4.7		<0.93		<0.47	
		10/28/2010	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		4/15/2011	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		10/11/2011	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		10/24/2012	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		10/16/2013	<19		<19		<19		<9.5		<9.5		<9.5	
		12/15/2014	<19		<19		<19		<9.5		<9.5		<9.5	
		10/28/2015	<2		<2		<1		<1		<1		NA	
		10/6/2016	<2.0		<2.0		<1.0		<1.0		<1.0		NA	
		10/9/2017	<1.6		<1.6		<0.8		<0.8		<0.8		NA	
		10/2/2018	<1.6		<1.6		<0.8		<0.8		<0.8		NA	
							Downgradient							
	MW333	5/12/2008	<0.98		<0.49		<1.5		<4.9		<0.98		<0.49	
		10/6/2008	<0.98		<0.49		<1.4		<4.7		<0.98		<0.47	
		5/5/2009	<1.3		<0.47		<0.94		<4.7		<0.94		<0.47	
		10/28/2009	<1.3		<0.47		<0.93	U / UJ	<4.7	U / UJ	<0.93		<0.47	
		4/13/2010	<1.3	U / UJ	<0.47	U / UJ	<0.93		<4.7		<0.93		<0.47	
		10/28/2010	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		4/18/2011	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		10/11/2011	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		10/24/2012	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		10/16/2013	<19		<19		<19		<9.5		<9.5		<9.5	
		12/15/2014	<19		<19		<19		<9.5		<9.5		<9.5	
		10/28/2015	<2		<2		<1		<1		<1		NA	
		10/6/2016	<2.0		<2.0		<1.0		<1.0		<1.0		NA	
		10/9/2017	<1.6		<1.6		<0.8		<0.8		<0.8		NA	
		10/2/2018	<1.6		<1.6		<0.8		<0.8		<0.8		NA	
	MW334	5/12/2008	<0.98		<0.49		<1.5		<4.9		<0.98		<0.49	
		10/6/2008	<0.97		<0.49		<1.5		<4.9		<0.97		<0.49	
		5/5/2009	<1.3		<0.48		<0.95		<4.8		<0.95		<0.48	
		10/28/2009	<1.3		<0.47		<0.93	U / UJ	<4.7	U / UJ	<0.93		<0.47	
		4/13/2010	<1.3	U / UJ	<0.47	U / UJ	<0.93		<4.7		<0.93		<0.47	
		10/28/2010	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		4/18/2011	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		10/11/2011	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		10/11/2010 (DUP)	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		10/24/2012	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		10/16/2013	<19		<19		<19		<9.4		<9.4		<9.4	
		12/15/2014	<19		<19		<19		<9.5		<9.5		<9.5	
		10/28/2015	<2		<2		<1		<1		<1		NA	
		10/6/2016	<2.0		<2.0		<1.0		<1.0		<1.0		NA	
		10/9/2017	<1.6		<1.6		<0.8		<0.8		<0.8		NA	
		10/2/2018	<1.6		<1.6		<0.8		<0.8		<0.8		NA	
	MW335	5/13/2008	<0.96		<0.48		<1.4		<4.8		<0.96		<0.48	
		10/7/2008	<0.99		<0.5		<1.5		<5		<0.99		<0.5	
		10/7/2008 (DUP)	<0.94		<0.47		<1.4		<4.7		<0.94		<0.47	
		5/4/2009	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		10/28/2009	<1.3		<0.47		<0.94	U / UJ	<4.7	U / UJ	<0.94		<0.47	
		4/13/2010	<1.3	U / UJ	<0.47	U / UJ	<0.93		<4.7		<0.93		<0.47	
		4/13/2010 (DUP)	<1.3	U / UJ	<0.47	U / UJ	<0.93		<4.7		<0.93		<0.47	
		10/28/2010	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		4/15/2011	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		10/12/2011	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		4/16/2012	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	U / UJ
		10/24/2012	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		10/16/2013	<19		<19		<19		<9.5		<9.5		<9.5	
		10/16/2013 (DUP)	<19		<19		<19		<9.5		<9.5		<9.5	
		12/11/2014	<19		<19		<19		<9.5		<9.5		<9.5	
		12/11/2014 (DUP)	<19		<19		<19		<9.5		<9.5		<9.5	
		10/28/2015	<2		<2		<1		<1		<1		NA	
		10/6/2016	<2.0		<2.0		<1.0		<1.0		<1.0		NA	
		10/6/2016 (DUP)	<2.0		<2.0		<1.0		<1.0		<1.0		NA	
		10/9/2017	<1.6		<1.6		<0.8		<0.8		<0.8		NA	
		10/2/2018	<1.6		<1.6		<0.8		<0.8	/ UJ	<0.8		NA	

TABLE B5

Summary of Analytical Results - Semivolatile Organic Compounds
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

		Compound	**2,4-DNT**		**2,6-DNT**		**NB**		**Phenol**		**Naphthalene**		**2-Methylnaphthalene**	
		Units	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
		Project Action Limit[1]	0.42		0.42		51		NS		NS		NS	
Site	**Well**	**Date**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**	**Result**	**LF/VF**
M11[2]	***Downgradient***													
	MW336	5/13/2008	<0.96		<0.48		<1.4		<4.8		<0.96		<0.48	
		10/7/2008	<0.93		<0.47		<1.4		<4.7		<0.93		<0.47	
		5/5/2009	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		5/5/2009 (DUP)	<1.3		<0.47		<0.94		<4.7		<0.94		<0.47	
		10/27/2009	<1.3		<0.47		<0.93	U / UJ	<4.7	U / UJ	<0.93		<0.47	
		10/27/2009 (DUP)	<1.3		<0.47		<0.93	U / UJ	<4.7	U / UJ	<0.93		<0.47	
		4/13/2010	<1.3	U / UJ	<0.47	U / UJ	<0.93		<4.7		<0.93		<0.47	
		10/28/2010	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		4/18/2011	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		10/12/2011	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		4/16/2012	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		10/24/2012	<1.3	U / J	<0.47	U / J	<0.93	U / J	<4.7	U / J	<0.93	U / J	<0.47	U / J
		10/24/2012	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		10/16/2013	<19		<19		<19		<9.5		<9.5		<9.5	
		12/11/2014	<19		<19		<19		<9.6		<9.6		<9.6	
		10/28/2015	<2	/ UJ	<2	/ UJ	<1	/ UJ	<1		<1	/ UJ	NA	
		10/6/2016	<2.0		<2.0		<1.0		<1.0		<1.0		NA	
		10/9/2017	<1.6		<1.6		<0.8		<0.8		<0.8		NA	
		10/2/2018	<1.6		<1.6		<0.8		<0.8		<0.8		NA	
	MW804	5/15/2008	<0.96		<0.48		<1.4		<4.8		<0.96		<0.48	
		10/6/2008	<0.94		<0.47		<1.4		<4.7		<0.94		<0.47	
		5/5/2009	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		10/27/2009	<1.3		<0.48		<0.95	U / UJ	<4.8	U / UJ	<0.95		<0.48	
		4/13/2010	<1.3	U / UJ	<0.47	U / UJ	<0.93		<4.7		<0.93		<0.47	
		10/28/2010	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		4/15/2011	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		4/15/2011 (DUP)	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		10/11/2011	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		10/24/2012	<4		<1.4		<2.9		<14		<2.9		<1.4	
		10/16/2013	<19		<19		<19		<9.6		<9.6		<9.6	
		12/11/2014	<22		<22		<22		<11		<11		<11	
		10/28/2015	<2		<2		<1		<1		<1		NA	
		10/6/2016	<2.0		<2.0		<1.0		<1.0		<1.0		NA	
		10/9/2017	<1.6		<1.6		<0.8		<0.8		<0.8		NA	
		10/2/2018	<1.6		<1.6		<0.8		<0.8		<0.8		NA	
	MW805	10/6/2008	<1		<0.51		<1.5		<5.1		<1		<0.51	
		5/5/2009	<1.3		<0.47		<0.94		<4.7		<0.94		<0.47	
		10/27/2009	<1.3		<0.47		<0.93	U / UJ	<4.7	U / UJ	<0.93		<0.47	
		4/13/2010	<1.3	U / UJ	<0.47	U / UJ	<0.93		<4.7		<0.93		<0.47	
		11/2/2010	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		4/15/2011	<1.3		<0.47		<0.93	U / UJ	<4.7		<0.93		<0.47	
		10/11/2011	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		4/16/2012	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	U / UJ
		10/24/2012	<1.3		<0.47		<0.93		<4.7		<0.93		<0.47	
		10/16/2013	<19		<19		<19		<9.5		<9.5		<9.5	
		12/11/2014	<19		<19		<19		<9.5		<9.5		<9.5	
		10/28/2015	<2		<2		<1		<1		<1		NA	
		10/28/2015 (DUP)	<2		<2		<1		<1		<1		NA	
		10/6/2016	<2.0		<2.0		<1.0		<1.0		<1.0		NA	
		10/9/2017	<1.6		<1.6		<0.8		<0.8		<0.8		NA	
		10/9/2017 (DUP)	<1.6		<1.6		<0.8		<0.8		<0.8		NA	
		10/2/2018	<1.6		<1.6		<0.8		<0.8		<0.8		NA	

Notes:
An abbreviated list of compounds analyzed is used for reporting based on historically detected and reported compounds.
Data since the sampling round conducted immediately prior to the completion of each individual site remedial action are shown.
See Table B1 for 2,4-DNT and 2,6-DNT results where the semivolatile organic compound reporting limit exceeded the Remedial Goal (RG).
µg/L = Micrograms per liter.
NS = No standard.
LF/VF = Lab flag/validation flag.
< = Result shows laboratory Method Reporting Limit for non-detected results.
U = Not detected.
UJ = Estimated detection limit.
F = Concentration below the reported detection limit.
DUP = Duplicate.
J = Estimated concentration.
R = Rejected data, unusable.
Bolded result indicates Project Action Limit (RG) exceedance.

2,4-DNT = 2,4-Dinitrotoluene.
2,6-DNT = 2,6-Dinitrotoluene.
NB = Nitrobenzene.

Footnotes:
(1) Project Action Limits are the RGs as specified in Table 6-2 of the 1998 Record of Decision. Where no RG is presented in the 1998 Record of Decision, the Project Action Limit is obtained from Illinois Environmental Protection Agency Class II groundwater standards.
(2) Site M11 sampled only during the Annual round.

APPENDIX C

DATA REPORTS

C1 – Data Validation Report
C2 – Data Usability Report

C1 – DATA VALIDATION REPORT

LABORATORY DATA CONSULTANTS, INC.
2701 Loker Ave. West, Suite 220, Carlsbad, CA 92010 Bus: 760-827-1100 Fax: 760-827-1099

Stantec
35055 W. 12 Mile Rd., Suite 140
Farmington Hills, MI 48331
ATTN: Ms. Linda Goad

December 21, 2018

SUBJECT: Joliet Army Ammunition Plant (JOAAP), Data Validation

Dear Ms. Goad,

Enclosed are the final validation reports for the fractions listed below. These SDGs were received on November 29, 2018. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project #43824:

SDG #	Fraction
TJ03033, TJ06011 TJ09009, TJ10017 TJ11067	Volatiles, Semivolatiles, Metals, Wet Chemistry, Explosives

The data validation was performed under Level III & IV guidelines. The analyses were validated using the following documents, as applicable to each method:

- Final Appendix B - 2017 Quality Assurance Project Plan Update, Long-Term Monitoring Plan (2017 QAPP; IEA/MWH JV; July 2017)
- U.S. Department of Defense Quality Systems Manual for Environmental Laboratories, Version 5.1; 2017
- USEPA National Functional Guidelines for Organic Superfund Methods Data Review; January 2017
- USEPA National Functional Guidelines for Inorganic Superfund Methods Data Review; January 2017
- EPA SW 846, Third Edition, Test Methods for Evaluating Solid Waste, update 1, July 1992; update IIA, August 1993; update II, September 1994; update IIB, January 1995; update III, December 1996; update IIIA, April 1998; IIIB, November 2004; update IV, February 2007; update V, July 2014

Please feel free to contact us if you have any questions.

Sincerely,

Christina Rink

Christina Rink
Project Manager/Senior Chemist

EDD 90/10 LDC #43824 (Stantec Consulting Services, Inc.-Detroit, MI / Joliet Army Ammunition Plant (JOAAP))

LDC	SDG#	DATE REC'D	(3) DATE DUE	VOA (8260B)		SVOA (8270D)		Metals (6010D /7470A)		Expl. (8330A)		SO_4 NO_3-N (9056A)		SO_4 (9056A)																							
Matrix:	Water/Soil			W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S
A	TJ03033	11/29/18	12/20/18	7	0	6	0	6	0	12	0	6	0	0	0																						
A	TJ03033	11/29/18	12/20/18	2	0	2	0	2	0	5	0	2	0	2	0																						
B	TJ06011	11/29/18	12/20/18	-	-	-	-	-	-	12	0	-	-	10	0																						
C	TJ09009	11/29/18	12/20/18	-	-	-	-	-	-	8	0	-	-	1	0																						
D	TJ10017	11/29/18	12/20/18	10	0	9	0	9	0	9	0	9	0	-	-																						
E	TJ11067	11/29/18	12/20/18	-	-	-	-	-	-	3	0	-	-	-	-																						
Total	T/CR			19	0	17	0	17	0	49	0	17	0	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	132

Shaded cells indicate Level IV validation (all other cells are Level III validation). These sample counts do not include MS/MSD, and DUPs

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Joliet Army Ammunition Plant

LDC Report Date: January 2, 2019

Parameters: Volatiles

Validation Level: Level III & IV

Laboratory: Shealy Environmental Services, Inc.

Sample Delivery Group (SDG): TJ03033

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
TRIP BLANK	TJ03033-010	Water	10/02/18
JP-M11-GWMW335	TJ03033-011	Water	10/02/18
JP-M11-GWMW804	TJ03033-012	Water	10/02/18
JP-M11-GWMW805**	TJ03033-013**	Water	10/02/18
JP-M11-GWMW336	TJ03033-014	Water	10/02/18
JP-M11-GWMW334**	TJ03033-015**	Water	10/02/18
JP-M11-GWMW333	TJ03033-016	Water	10/02/18
JP-M11-GWMW803	TJ03033-017	Water	10/02/18
JP-M11-GWMW802	TJ03033-018	Water	10/02/18

**Indicates sample underwent Level IV validation

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Appendix B - 2017 Quality Assurance Project Plan Update, Long-Term Monitoring Plan (2017 QAPP; IEA/MWH JV, July 2017), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.1 (2017), and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Level III data validation, which comprises an evaluation of quality control (QC) summary results. Samples appended with a double asterisk on the cover page were subjected to Level IV data validation, which is comprised of the QC summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met with the following exceptions:

Sample	Compound	Total Days From Sample Collection Until Analysis	Required Holding Time (in Days) From Sample Collection Until Analysis	Flag	A or P
JP-M11-GWMW805**	All compounds	13	7	UJ (all non-detects)	A

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals. All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 15.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
10/15/18	Acetone	25.5	All samples in SDG TJ03033	J (all detects) UJ (all non-detects)	A

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample TRIP BLANK was identified as a trip blank. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Compound	Concentration	Associated Samples
TRIP BLANK	10/02/18	Acetone	2.1 ug/L	JP-M11-GWMW335 JP-M11-GWMW804 JP-M11-GWMW805** JP-M11-GWMW336 JP-M11-GWMW334** JP-M11-GWMW333 JP-M11-GWMW803 JP-M11-GWMW802

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater (>10X for common contaminants, >5X for other contaminants) than the concentrations found in the associated field blanks.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits with the following exceptions:

Sample	Surrogate	%R (Limits)	Affected Compound	Flag	A or P
JP-M11-GWMW335	Toluene-d8	114 (89-112)	All compounds	NA	-

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria for samples which underwent Level IV validation. Raw data were not reviewed for Level III validation.

XIII. Target Compound Identifications

All target compound identifications met validation criteria for samples which underwent Level IV validation. Raw data were not reviewed for Level III validation.

XIV. System Performance

The system performance was acceptable for samples which underwent Level IV validation. Raw data were not reviewed for Level III validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to technical holding time and continuing calibration %D, data were qualified as estimated in nine samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Joliet Army Ammunition Plant
Volatiles - Data Qualification Summary - SDG TJ03033

Sample	Compound	Flag	A or P	Reason
JP-M11-GWMW805**	All compounds	UJ (all non-detects)	A	Technical holding times
TRIP BLANK JP-M11-GWMW335 JP-M11-GWMW804 JP-M11-GWMW805** JP-M11-GWMW336 JP-M11-GWMW334** JP-M11-GWMW333 JP-M11-GWMW803 JP-M11-GWMW802	Acetone	J (all detects) UJ (all non-detects)	A	Continuing calibration (%D)

Joliet Army Ammunition Plant
Volatiles - Laboratory Blank Data Qualification Summary - SDG TJ03033

No Sample Data Qualified in this SDG

Joliet Army Ammunition Plant
Volatiles - Field Blank Data Qualification Summary - SDG TJ03033

No Sample Data Qualified in this SDG

LDC #: 43824A1 **VALIDATION COMPLETENESS WORKSHEET** Date: 12/19/18
SDG #: TJ03033 Level III/IV Page: 1 of 1
Laboratory: Shealy Environmental Services, Inc. Reviewer: [illegible]
2nd Reviewer: [illegible]

METHOD: GC/MS Volatiles (EPA SW846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	SW/A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A/A	% RSD, r^2 ICV ≤ 20
IV.	Continuing calibration /closing CCV	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	SW	TB = 1
VII.	Surrogate spikes	SW	
VIII.	Matrix spike/Matrix spike duplicates	N	MS
IX.	Laboratory control samples	A	LCS
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	Not reviewed for Level III validation.
XIII.	Target compound identification	A	Not reviewed for Level III validation.
XIV.	System performance	A	Not reviewed for Level III validation.
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

** Indicates sample underwent Level IV validation

	Client ID	Lab ID	Matrix	Date
1	TRIP BLANK	TJ03033-010	Water	10/02/18
2	JP-M11-GWMW335	TJ03033-011	Water	10/02/18
3	JP-M11-GWMW804	TJ03033-012	Water	10/02/18
4	JP-M11-GWMW805**	TJ03033-013**	Water	10/02/18
5	JP-M11-GWMW336	TJ03033-014	Water	10/02/18
6	JP-M11-GWMW334**	TJ03033-015**	Water	10/02/18
7	JP-M11-GWMW333	TJ03033-016	Water	10/02/18
8	JP-M11-GWMW803	TJ03033-017	Water	10/02/18
9	JP-M11-GWMW802	TJ03033-018	Water	10/02/18
10				
11	VBLKSF			
12				
13				

LDC #: 43824 A1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Method: Volatiles (EPA SW 846 Method 8260B)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ 30% 15% and relative response factors (RRF) > 0.05?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) ≥ 0.05?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks?		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?	✓			
Were target compounds detected in the field blanks?	✓			
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?		✓		
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?		✓		

LDC #: 43824A1

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [signature]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were matrix spike (MS) and matrix spike duplicate (MSD) analyzed in this SDG?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
IX. Laboratory control samples				
Was an LCS analyzed per analytical batch in this SDG?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Did the laboratory LOQs/RLs meet the QAPP LOQs/RLs?	✓			
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 43824A1

VALIDATION FINDINGS WORKSHEET
Technical Holding Times

Page: 1 of 1
Reviewer: FT
2nd Reviewer:

All circled dates have exceeded the technical holding times.
Y N N/A Were all cooler temperatures within validation criteria?
Y N N/A Were air bubbles > 1/4 inch or was headspace present in the vials?

METHOD : GC/MS VOA (EPA SW 846 Method 8260B)

Sample ID	Matrix	Preserved	Sampling Date	Extraction date	Analysis date	Total # of Days	Qualifier
4	W	pH=5	10/2/18		10/15/18	13	J/UJ/A (ND)

TECHNICAL HOLDING TIME CRITERIA

Water unpreserved:	Aromatic within 7 days, non-aromatic within 14 days of sample collection.
Water preserved:	Within 14 days of sample collection.
Soil:	Within 14 days of sample collection.

LDC #: 43824A1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
	10/15/18 0913	CCV	F	25.5		All	J/UJ/A ND+Det

CONCAL.wpd

LDC #: 43824A1

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: FT
2nd Reviewer:

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)
Y N N/A Were field blanks identified in this SDG?
Y N N/A Were target compounds detected in the field blanks?
Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 10/2/18
Field blank type: (circle one) Field Blank / Rinsate / Trip Blank / Other: TB Associated Samples: 2 → 9 (ND)

Compound	Blank ID	Sample Identification								
	1									
F	2.1									

Blank units: _____ **Associated sample units:** _____
Sampling date: _____
Field blank type: (circle one) Field Blank / Rinsate / Trip Blank / Other: _____ Associated Samples: _____

Compound	Blank ID	Sample Identification								

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Common contaminants such as Methylene chloride, Acetone, 2-Butanone and Carbon disulfide that were detected in samples within ten times the associated field blank concentration were qualified as not detected, "U". Other contaminants within five times the field blank concentration were also qualified as not detected, "U".

FBLKASC2.wpd

LDC #: Y3824A /

VALIDATION FINDINGS WORKSHEET
Surrogate Spikes

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were all surrogate %R within QC limits?

Y N N/A If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R out of outside of criteria?

#	Sample ID	Surrogate	%Recovery (Limits)	Qualifications
	2	Tol	114 (89-112)	J all P all ND
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	

SMC1 (TOL) = Toluene-d8
SMC2 (BFB) = Bromofluorobenzene
SMC3 (DCE) = 1,2-Dichloroethane-d4
SMC4 (DFM) = Dibromofluoromethane

LDC #: 43824A1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GCMS 8260B

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:

Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 20 std)	Recalculated (RRF 20 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	10/12/2018	C	0.377307	0.377307	0.376336	0.376336	5.9	5.9
	7		V	1.069588	1.069588	1.087749	1.087749	5.3	5.3
			CC	0.758991	0.758991	0.754287	0.754287	11.4	11.4
			BB	1.036048	1.036048	1.063323	1.063323	3.2	3.2

LDC #: 43824A1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	dcV0913	10/15/18	C (1st internal standard)	0.376336	0.381589	0.381589	1.4	1.4
			V (2nd internal standard)	1.087749	1.098619	1.098619	1	1
			CC (3rd internal standard)	0.754287	0.716765	0.716765	5	5
			BB (4th internal standard)	1.063323	0.913068	0.913068	14.1	14.1
2			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					
3			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					
4			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 43824A1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: # 4

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	51.775	104	104	0
1,2-Dichloroethane-d4	↓	48.495	97	97	↓
Toluene-d8		49.036	98	98	
Bromofluorobenzene		46.567	93	93	

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 43824A1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT
2nd Reviewer:

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: VBLKJF LCS

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
1,1-Dichloroethene	50	NA	54	NA	107	107				
Trichloroethene	↓	↓	53	↓	105	105				
Benzene	50	↓	49	↓	99	99				
Toluene	↓	↓	52	↓	103	103				
Chlorobenzene	↓	↓	49	↓	97	97	NA			

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 43824A1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were all reported results recalculated and verified for all level IV samples?

Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
RRF	=	Relative response factor of the calibration standard.
V_o	=	Volume or weight of sample pruged in milliliters (ml) or grams (g).
Df	=	Dilution factor.
%S	=	Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. VBLKSF 105 : √

Conc. = $\frac{(1318923)(50)}{(1228934)(1.087749)}$

= 49.33 ug/L

#	Sample ID	Compound	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Qualification
	LCS	√	49	49.33	

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Joliet Army Ammunition Plant

LDC Report Date: December 19, 2018

Parameters: Semivolatiles

Validation Level: Level III & IV

Laboratory: Shealy Environmental Services, Inc.

Sample Delivery Group (SDG): TJ03033

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
JP-M11-GWMW335	TJ03033-011	Water	10/02/18
JP-M11-GWMW804	TJ03033-012	Water	10/02/18
JP-M11-GWMW805**	TJ03033-013**	Water	10/02/18
JP-M11-GWMW336	TJ03033-014	Water	10/02/18
JP-M11-GWMW334**	TJ03033-015**	Water	10/02/18
JP-M11-GWMW333	TJ03033-016	Water	10/02/18
JP-M11-GWMW803	TJ03033-017	Water	10/02/18
JP-M11-GWMW802	TJ03033-018	Water	10/02/18
JP-M11-GWMW335MS	TJ03033-011MS	Water	10/02/18
JP-M11-GWMW335MSD	TJ03033-011MSD	Water	10/02/18

**Indicates sample underwent Level IV validation

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Appendix B - 2017 Quality Assurance Project Plan Update, Long-Term Monitoring Plan (2017 QAPP; IEA/MWH JV, July 2017), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.1 (2017), and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270D

All sample results were subjected to Level III data validation, which comprises an evaluation of quality control (QC) summary results. Samples appended with a double asterisk on the cover page were subjected to Level IV data validation, which is comprised of the QC summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals. All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 15.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
10/22/18 (18:33)	2-Methylphenol	20.1	All samples in SDG TJ03033	UJ (all non-detects)	A
10/22/18 (22:33)	Benzidine	20.3	All samples in SDG TJ03033	UJ (all non-detects)	A

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
10/23/18 (09:10)	Aniline 2,4-Dinitrophenol	43.7 22.1	All samples in SDG TJ03033	UJ (all non-detects) UJ (all non-detects)	A
10/23/18 (09:34)	Benzidine	31.3	All samples in SDG TJ03033	UJ (all non-detects)	A

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Compound	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
JP-M11-GWMW335MS/MSD (JP-M11-GWMW335)	Aniline Phenol	22 (30-130) 46 (49-117)	21 (30-130) -	UJ (all non-detects) UJ (all non-detects)	A
JP-M11-GWMW335MS/MSD (JP-M11-GWMW335)	Benzidine 3,3'-Dichlorobenzidine	0 (10-54) 0 (27-129)	0 (10-54) 0 (27-129)	R (all non-detects) R (all non-detects)	A

Relative percent differences (RPD) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Compound	RPD (Limits)	Flag	A or P
JP-M11-GWMW335MS/MSD (JP-M11-GWMW335)	Benzyl alcohol	75 (≤20)	NA	-

IX. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria for samples which underwent Level IV validation. Raw data were not reviewed for Level III validation.

XIII. Target Compound Identifications

All target compound identifications met validation criteria for samples which underwent Level IV validation. Raw data were not reviewed for Level III validation.

XIV. System Performance

The system performance was acceptable for samples which underwent Level IV validation. Raw data were not reviewed for Level III validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method.

Due to MS/MSD %R, data were rejected in one sample.

Due to ICV %D, continuing calibration %D, and MS/MSD %R, data were qualified as estimated in eight samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be rejected (R) are unusable for all purposes. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Joliet Army Ammunition Plant
Semivolatiles - Data Qualification Summary - SDG TJ03033

Sample	Compound	Flag	A or P	Reason
JP-M11-GWMW335	2-Methylphenol	UJ (all non-detects)	A	Initial calibration verification (%D)
JP-M11-GWMW804 JP-M11-GWMW805** JP-M11-GWMW336 JP-M11-GWMW334** JP-M11-GWMW333 JP-M11-GWMW803 JP-M11-GWMW802	2-Methylphenol Benzidine	UJ (all non-detects) UJ (all non-detects)	A	Initial calibration verification (%D)
JP-M11-GWMW335	Aniline 2,4-Dinitrophenol	UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)
JP-M11-GWMW804 JP-M11-GWMW805** JP-M11-GWMW336 JP-M11-GWMW334** JP-M11-GWMW333 JP-M11-GWMW803 JP-M11-GWMW802	Aniline 2,4-Dinitrophenol Benzidine	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)
JP-M11-GWMW335	Aniline Phenol	UJ (all non-detects) UJ (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)
JP-M11-GWMW335	Benzidine 3,3'-Dichlorobenzidine	R (all non-detects) R (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)

Joliet Army Ammunition Plant
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG TJ03033

No Sample Data Qualified in this SDG

Joliet Army Ammunition Plant
Semivolatiles - Field Blank Data Qualification Summary - SDG TJ03033

No Sample Data Qualified in this SDG

LDC #: 43824A2a

VALIDATION COMPLETENESS WORKSHEET

Level III/IV

Date: 12/19/18

SDG #: TJ03033

Page: 1 of 1

Laboratory: Shealy Environmental Services, Inc.

Reviewer:

2nd Reviewer:

METHOD: GC/MS Semivolatiles (EPA SW846 Method 8270D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / SW	% RSD ≤ 15, r² ICV ≤ 20
IV.	Continuing calibration / closing CCV	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	SW	
IX.	Laboratory control samples	A	LCS
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	A	Not reviewed for Level III validation.
XIII.	Target compound identification	A	Not reviewed for Level III validation.
XIV.	System performance	A	Not reviewed for Level III validation.
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

** Indicates sample underwent Level IV validation

	Client ID	Lab ID	Matrix	Date
1	JP-M11-GWMW335	TJ03033-011	Water	10/02/18
2	JP-M11-GWMW804	TJ03033-012	Water	10/02/18
3	JP-M11-GWMW805**	TJ03033-013**	Water	10/02/18
4	JP-M11-GWMW336	TJ03033-014	Water	10/02/18
5	JP-M11-GWMW334**	TJ03033-015**	Water	10/02/18
6	JP-M11-GWMW333	TJ03033-016	Water	10/02/18
7	JP-M11-GWMW803	TJ03033-017	Water	10/02/18
8	JP-M11-GWMW802	TJ03033-018	Water	10/02/18
9	JP-M11-GWMW335MS	TJ03033-011MS	Water	10/02/18
10	JP-M11-GWMW335MSD	TJ03033-011MSD	Water	10/02/18
11				
12	85511			
13				

LDC #: 43824 A2a

VALIDATION FINDINGS CHECKLIST

Reviewer: B
2nd Reviewer:

Method: Semivolatiles (EPA SW 846 Method 8270D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS Instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 15% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20%?		✓		
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the blanks validation findings worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target compounds detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	
If any percent recoveries (%R) was less than 10%, was a reanalysis performed to confirm %R ?			✓	
VIII. Matrix spike/Matrix spike duplicates				
Were matrix spike (MS) and matrix spike duplicate (MSD) analyzed in this SDG?	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?		✓		

LDC #: 43824A2a

VALIDATION FINDINGS CHECKLIST

Page: 2 of 2
Reviewer: [illegible]
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Did the laboratory LOQs/RLs meet the QAPP LOQs/RLs?	✓			
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	CC. Dimethylphthalate	EEE. Bis(2-ethylhexyl)phthalate	GGGG. C30-Hopane	I1. Methyl methanesulfonate
B. Bis (2-chloroethyl) ether	DD. Acenaphthylene	FFF. Di-n-octylphthalate	HHHH. 1-Methylphenanthrene	J1. Ethyl methanesulfonate
C. 2-Chlorophenol	EE. 2,6-Dinitrotoluene	GGG. Benzo(b)fluoranthene	IIII. 1,4-Dioxane	K1. o,o',o''-Triethylphosphorothioate
D. 1,3-Dichlorobenzene	FF. 3-Nitroaniline	HHH. Benzo(k)fluoranthene	JJJJ. Acetophenone	L1. n-Phenylene diamine
E. 1,4-Dichlorobenzene	GG. Acenaphthene	III. Benzo(a)pyrene	KKKK. Atrazine	M1. 1,4-Naphthoquinone
F. 1,2-Dichlorobenzene	HH. 2,4-Dinitrophenol	JJJ. Indeno(1,2,3-cd)pyrene	LLLL. Benzaldehyde	N1. N-Nitro-o-toluidine
G. 2-Methylphenol	II. 4-Nitrophenol	KKK. Dibenz(a,h)anthracene	MMMM. Caprolactam	O1. 1,3,5-Trinitrobenzene
H. 2,2'-Oxybis(1-chloropropane)	JJ. Dibenzofuran	LLL. Benzo(g,h,i)perylene	NNNN. 2,6-Dichlorophenol	P1. Pentachlorobenzene
I. 4-Methylphenol	KK. 2,4-Dinitrotoluene	MMM. Bis(2-Chloroisopropyl)ether	OOOO. 1,2-Diphenylhydrazine	Q1. 4-Aminobiphenyl
J. N-Nitroso-di-n-propylamine	LL. Diethylphthalate	NNN. Aniline	PPPP. 3-Methylphenol	R1. 2-Naphthylamine
K. Hexachloroethane	MM. 4-Chlorophenyl-phenyl ether	OOO. N-Nitrosodimethylamine	QQQQ. 3&4-Methylphenol	S1. Triphenylene
L. Nitrobenzene	NN. Fluorene	PPP. Benzoic Acid	RRRR. 4-Dimethyldibenzothiophene (4MDT)	T1. Octachlorostyrene
M. Isophorone	OO. 4-Nitroaniline	QQQ. Benzyl alcohol	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	U1. Famphur
N. 2-Nitrophenol	PP. 4,6-Dinitro-2-methylphenol	RRR. Pyridine	TTTT. 1-Methyldibenzothiophene (1MDT)	V1. 1,4-phenylenediamine
O. 2,4-Dimethylphenol	QQ. N-Nitrosodiphenylamine	SSS. Benzidine	UUUU.. 2,3,4,6-Tetrachlorophenol	W1. Methapyrilene
P. Bis(2-chloroethoxy)methane	RR. 4-Bromophenyl-phenylether	TTT. 1-Methylnaphthalene	VVVV. 1,2,4,5-Tetrachlorobenzene	X1. Pentachloroethane
Q. 2,4-Dichlorophenol	SS. Hexachlorobenzene	UUU.Benzo(b)thiophene	WWWW.. 2-Picoline	Y1. 3,3'-Dimethylbenzidine
R. 1,2,4-Trichlorobenzene	TT. Pentachlorophenol	VVV.Benzonaphthothiophene	XXXX. 3-Methylcholanthrene	Z1. o-Toluidine
S. Naphthalene	UU. Phenanthrene	WWW.Benzo(e)pyrene	YYYY. a,a-Dimethylphenethylamine	A2. 1-Naphthylamine
T. 4-Chloroaniline	VV. Anthracene	XXX. 2,6-Dimethylnaphthalene	ZZZZ. Hexachloropropene	B2. 4-Aminobiphenyl
U. Hexachlorobutadiene	WW. Carbazole	YYY. 2,3,5-Trimethylnaphthalene	A1. N-Nitrosodiethylamine	C2. 4-Nitroquinoline-1-oxide
V. 4-Chloro-3-methylphenol	XX. Di-n-butylphthalate	ZZZ. Perylene	B1. N-Nitrosodi-n-butylamine	D2. Hexachloropene
W. 2-Methylnaphthalene	YY. Fluoranthene	AAAA. Dibenzothiophene	C1. N-Nitrosomethylethylamine	E2. Bis (2-chloro-1-methylethyl) ether
X. Hexachlorocyclopentadiene	ZZ. Pyrene	BBBB. Benzo(a)fluoranthene	D1. N-Nitrosomorpholine	F2. Bifenthrin
Y. 2,4,6-Trichlorophenol	AAA. Butylbenzylphthalate	CCCC. Benzo(b)fluorene	E1. N-Nitrosopyrrolidine	G2.Cyfluthrin
Z. 2,4,5-Trichlorophenol	BBB. 3,3'-Dichlorobenzidine	DDDD. cis/trans-Decalin	F1. Phenacetin	H2.Cypermethrin
AA. 2-Chloronaphthalene	CCC. Benzo(a)anthracene	EEEE. Biphenyl	G1. 2-Acetylaminofluorene	I2.Permethrin (cis/trans)
BB. 2-Nitroaniline	DDD. Chrysene	FFFF. Retene	H1. Pronamide	J2. 5-Nitro-o-toluidine

LDC #: 43824 A2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Verification

Reviewer: FT
2nd Reviewer:

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".
Y N N/A Was an initial calibration verification standard analyzed after each ICAL for each instrument?
Y N N/A Were all %D within the validation criteria of ~~<30~~ 20 %D ?

#	Date	Standard ID	Compound	Finding %D (Limit: ~~<30.0~~ 20%)	Associated Samples	Qualifications
	10/22/18 1833	ICV	G	20.1	All	J/UJ/A ND
	10/22/18 2233	ICV	SSS	20.3	All	J/UJ/A ND

LDC #: 43824Ada

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
	10/23/18 0910	CCV	NNN	43.7		All	J/UJ/A MD
			HH	22.1		↓	↓
	10/23/18 0934	CCV	SSS	31.3		All	J/UJ/A MD

CONCAL.wpd

LDC #: 43824A2a

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: FT
2nd Reviewer:

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.

Y N N/A Was a MS/MSD analyzed every 20 samples of each matrix?

Y N N/A Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	MS/MSD ID	Compound	MS %R (Limits)	MSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	9 + 10	NNN	22 (30-130)	21 (30-130)	( )	#1	J/UJ/A all MD
		SSS	0 (10-54)	0 (10-54)	( )	↓	J/R/A
		BBB	0 (27-129)	0 (27-129)		↓	↓
		A	46 (49-117)	( )	( )	↓	J/UJ/A
		QQQ	( )	~~75 (31-112)~~	75 (20)	↓	J det/A
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
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			( )	( )	( )		
			( )	( )	( )		

LDC #: 43824A2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT
2nd Reviewer: [signature]

METHOD: GCMS 8270~~C~~D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:
Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 10 ng std)	Recalculated (RRF 10 ng std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	10/22/2018	A	1.963544	1.963544	1.852502	1.852502	6.1	6.1
	MSD10		S	1.111554	1.111554	1.082136	1.082136	4.7	4.7
			GG	1.241713	1.241713	1.208838	1.208838	6.3	6.3
			UU	1.141388	1.141388	1.133785	1.133785	5.4	5.4
			EEE	0.797921	0.797921	0.771732	0.771732	9.0	9.0
			III	1.003805	1.003805	0.984786	0.984786	8.2	8.2

LDC #: 43824A2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT
2nd Reviewer:

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
RRF = $(A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Internal Standard)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 0910	10/23/18	A (1st IS)	1.852502	1.862156	1.862156	0.5	0.5
			S (2nd IS)	1.082136	1.09652	1.09652	1.3	1.3
			GG (3rd IS)	1.208838	1.223961	1.223961	1.3	1.3
			HH (4th IS)	1.133785	1.111908	1.111908	1.9	1.9
			EEE (5th IS)	0.771732	0.780091	0.780091	1.1	1.1
			III (6th IS)	0.984786	1.003733	1.003733	1.9	1.9
2			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					
3			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 43824A2a

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT
2nd reviewer:

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270D)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #5

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	10.0	7.6025	76	76	0
2-Fluorobiphenyl		5.0675	51	51	
Terphenyl-d14		8.4740	85	85	
Phenol-d5		4.0851	41	41	
2-Fluorophenol		2.7483	27	27	
2,4,6-Tribromophenol		6.3215	63	63	
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					
2-Chlorophenol-d4					
1,2-Dichlorobenzene-d4					

LDC #: 43824A2a

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Reviewer: FT
2nd Reviewer:

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the matrix spike and matrix spike duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SSC - SC)/SA Where: SSC = Spiked sample concentration; SA = Spike added; SC = Sample concentation

RPD = I MSC - MSC I * 2/(MSC + MSDC) MSC = Matrix spike concentration MSDC = Matrix spike duplicate concentration

MS/MSD samples: 9 + 10

Compound	Spike Added (ug/L)		Sample Concentration (ug/L)	Spiked Sample Concentration (ug/L)		Matrix Spike Percent Recovery		Matrix Spike Duplicate Percent Recovery		MS/MSD RPD	
	MS	MSD	------	MS	MSD	Reported	Recalc	Reported	Recalc	Reported	Recalc
Phenol	8.0	8.0	ND	3.7	4.0	46	46	49	49	6.8	6.8
N-Nitroso-di-n-propylamine	8.0	↓	↓	5.7	5.9	72	72	73	73	2.3	2.3
4-Chloro-3-methylphenol	8.0	↓	↓	5.0	5.2	63	63	65	65	3.2	3.2
Acenaphthene	8.0	↓	ND	4.8	5.1	60	60	63	63	5.3	5.3
Pentachlorophenol	16	16	↓	12	14	75	75	87	87	15	15
Pyrene	8.0	8.0	↓	6.0	6.2	75	75	78	78	3.5	3.5

Comments: Refer to Matrix Spike/Matrix Spike Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 43824A2a

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT
2nd Reviewer:

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SC/SA

Where: SSC = Spike concentration
SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC)

LCSC = Laboratory control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS/LCSD samples: 85511 LCS

Compound	Spike Added (ug/L)		Spike Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol	8.0	NA	4.1	NA	52	52				
N-Nitroso-di-n-propylamine	↓	↓	5.6	↓	71	71				
4-Chloro-3-methylphenol	↓	↓	4.9	↓	62	62				
Acenaphthene	↓	↓	5.2	↓	65	65				
Pentachlorophenol	16	↓	11	↓	71	71				
Pyrene	8.0	↓	6.5	↓	82	82	NA			

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 43824A2a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer:

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. #3, EEE

Conc. = $\frac{(55581)(20)(1.0)(1000)}{(2031035)(0.771732)(250)(5)}$

= 0.567 ug/L

#	Sample ID	Compound	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Qualification
	#3	EEE	0.57	0.567	

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Joliet Army Ammunition Plant

LDC Report Date: December 18, 2018

Parameters: Metals

Validation Level: Level III & IV

Laboratory: Shealy Environmental Services, Inc.

Sample Delivery Group (SDG): TJ03033

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
JP-M11-GWMW335	TJ03033-011	Water	10/02/18
JP-M11-GWMW804	TJ03033-012	Water	10/02/18
JP-M11-GWMW805**	TJ03033-013**	Water	10/02/18
JP-M11-GWMW336	TJ03033-014	Water	10/02/18
JP-M11-GWMW334**	TJ03033-015**	Water	10/02/18
JP-M11-GWMW333	TJ03033-016	Water	10/02/18
JP-M11-GWMW803	TJ03033-017	Water	10/02/18
JP-M11-GWMW802	TJ03033-018	Water	10/02/18
JP-M11-GWMW335MS	TJ03033-011MS	Water	10/02/18
JP-M11-GWMW335MSD	TJ03033-011MSD	Water	10/02/18
JP-M11-GWMW802MS	TJ03033-018MS	Water	10/02/18
JP-M11-GWMW802MSD	TJ03033-018MSD	Water	10/02/18

**Indicates sample underwent Level IV validation

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Appendix B - 2017 Quality Assurance Project Plan Update, Long-Term Monitoring Plan (2017 QAPP; IEA/MWH JV, July 2017), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.1 (2017), and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW846 Method 6010D
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Level III data validation, which comprises an evaluation of quality control (QC) summary results. Samples appended with a double asterisk on the cover page were subjected to Level IV data validation, which is comprised of the QC summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

III. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks with the following exceptions:

Blank ID	Analyte	Maximum Concentration	Associated Samples
PB (prep blank)	Arsenic	0.0035 mg/L	All samples in SDG TJ03033
ICB/CCB	Vanadium	0.0066 mg/L	JP-M11-GWMW335 JP-M11-GWMW804 JP-M11-GWMW805** JP-M11-GWMW336 JP-M11-GWMW334**
ICB/CCB	Vanadium	0.0067 mg/L	JP-M11-GWMW333 JP-M11-GWMW803 JP-M11-GWMW802
ICB/CCB	Lead	0.0055 mg/L	JP-M11-GWMW335 JP-M11-GWMW804 JP-M11-GWMW805**
ICB/CCB	Sodium	0.6575 mg/L	JP-M11-GWMW336 JP-M11-GWMW334** JP-M11-GWMW333 JP-M11-GWMW803 JP-M11-GWMW802

Data qualification by the laboratory blanks was based on the maximum contaminant concentration in the laboratory blanks in the analysis of each analyte. The sample concentrations were either not detected or were significantly greater (>5X blank contaminants) than the concentrations found in the associated laboratory blanks with the following exceptions:

Sample	Analyte	Reported Concentration	Modified Final Concentration
JP-M11-GWMW335	Arsenic Vanadium Lead	0.012 mg/L 0.0067 mg/L 0.0053 mg/L	0.012U mg/L 0.0067U mg/L 0.0053U mg/L
JP-M11-GWMW334**	Arsenic	0.0064 mg/L	0.0064U mg/L
JP-M11-GWMW802	Arsenic Vanadium	0.0048 mg/L 0.0077 mg/L	0.0048U mg/L 0.0077U mg/L
JP-M11-GWMW336	Vanadium	0.0067 mg/L	0.0067U mg/L

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
JP-M11-GWMW802MS/MSD (JP-M11-GWMW802)	Calcium Iron Magnesium	- - -	71 (87-113) 86 (87-115) 76 (85-113)	J (all detects) J (all detects) J (all detects)	A

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

The laboratory has indicated that there were no duplicate (DUP) analyses specified for the samples in this SDG, and therefore duplicate analyses were not performed for this SDG.

VIII. Serial Dilution

Serial dilution analysis was performed on an associated project sample. The analysis criteria were met.

IX. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Sample Result Verification

All sample result verifications were acceptable for samples which underwent Level IV validation. Raw data were not reviewed for Level III validation.

XII. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R, data were qualified as estimated in one sample.

Due to laboratory blank contamination, data were qualified as not detected in four samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Joliet Army Ammunition Plant
Metals - Data Qualification Summary - SDG TJ03033

Sample	Analyte	Flag	A or P	Reason
JP-M11-GWMW802	Calcium Iron Magnesium	J (all detects) J (all detects) J (all detects)	A	Matrix spike/Matrix spike duplicate (%R)

Joliet Army Ammunition Plant
Metals - Laboratory Blank Data Qualification Summary - SDG TJ03033

Sample	Analyte	Modified Final Concentration	A or P
JP-M11-GWMW335	Arsenic Vanadium Lead	0.012U mg/L 0.0067U mg/L 0.0053U mg/L	A
JP-M11-GWMW334**	Arsenic	0.0064U mg/L	A
JP-M11-GWMW802	Arsenic Vanadium	0.0048U mg/L 0.0077U mg/L	A
JP-M11-GWMW336	Vanadium	0.0067U mg/L	A

Joliet Army Ammunition Plant
Metals - Field Blank Data Qualification Summary - SDG TJ03033

No Sample Data Qualified in this SDG

LDC #: 43824A4b

VALIDATION COMPLETENESS WORKSHEET

Level III/IV

Date: 12-14-18

SDG #: TJ03033

Page: 1 of 1

Laboratory: Shealy Environmental Services, Inc.

Reviewer: MG

2nd Reviewer:

METHOD: Metals (EPA SW 846 Method 6010~~C~~D/7470A) MG

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II.	Instrument Calibration	A	
III.	ICP Interference Check Sample (ICS) Analysis	A	
IV.	Laboratory Blanks	SW	
V.	Field Blanks	N	
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/MSD
VII.	Duplicate sample analysis	N	
VIII.	Serial Dilution	A	SD: 8
IX.	Laboratory control samples	A	LCS
X.	Field Duplicates	N	
XI.	Sample Result Verification	A	Not reviewed for Level III validation.
XII.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

** Indicates sample underwent Level IV validation

	Client ID	Lab ID	Matrix	Date
1	JP-M11-GWMW335	TJ03033-011	Water	10/02/18
2	JP-M11-GWMW804	TJ03033-012	Water	10/02/18
3	JP-M11-GWMW805**	TJ03033-013**	Water	10/02/18
4	JP-M11-GWMW336	TJ03033-014	Water	10/02/18
5	JP-M11-GWMW334**	TJ03033-015**	Water	10/02/18
6	JP-M11-GWMW333	TJ03033-016	Water	10/02/18
7	JP-M11-GWMW803	TJ03033-017	Water	10/02/18
8	JP-M11-GWMW802	TJ03033-018	Water	10/02/18
9	JP-M11-GWMW335MS	TJ03033-011MS	Water	10/02/18
10	JP-M11-GWMW335MSD	TJ03033-011MSD	Water	10/02/18
11	JP-M11-GWMW802MS	TJ03033-018MS	Water	10/02/18
12	JP-M11-GWMW802MSD	TJ03033-018MSD	Water	10/02/18
13				
14	PBW			

Notes:

LDC #: 43824A4b

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Method: Metals (EPA SW 846 Method 6010/7000/6020)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. ICP/MS Tune				
Were all isotopes in the tuning solution mass resolution within 0.1 amu?			✓	
Were %RSD of isotopes in the tuning solution ≤5%?			✓	
III. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury) QC limits?	✓			
Were all initial calibration correlation coefficients > 0.995?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.	✓			
V. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	✓			ICSA only
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?			✓	
VI. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		✓		
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of +/- RL(+/-2X RL for soil) was used for samples that were ≤ 5X the RL, including when only one of the duplicate sample values were < 5X the RL.	✓			
VII. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	✓			

LDC #: 43824A46

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VIII. Internal Standards (EPA SW 846 Method 6020/EPA 200.8)				
Were all the percent recoveries (%R) within the 30-120% (6020)/60-125% (200.8) of the intensity of the internal standard in the associated initial calibration?			✓	
If the %Rs were outside the criteria, was a reanalysis performed?			✓	
IX. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the MDL (ICP)/>100X the MDL(ICP/MS)?	✓			
Were all percent differences (%Ds) < 10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
XIII. Field blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC #: 43824A4b

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Reviewer: MG
2nd reviewer: [illegible]

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1→8	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
ac 9.10	↓	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
↓ 11.12	↓	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
Analysis Method		
ICP	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
ICP-MS		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____

Comments: Mercury by CVAA if performed

LDC #: 43824A4b
SDG #: See Cover
METHOD: Trace metals (EPA SW 864 Method 6010D/7470A)

VALIDATION FINDINGS WORKSHEET
PB/ICB/CCB QUALIFIED SAMPLES

Soil preparation factor applied: NA

Reviewer: MG
2nd Reviewer:

Sample Concentration units, unless otherwise noted: mg/L Associated Samples: all

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (mg/L)	Maximum ICB/CCB[a] (mg/L)	Action Limit	1	5	8							
As		0.0035			0.012	0.0064	0.0048							

Sample Concentration units, unless otherwise noted: mg/L Associated Samples: 1-5

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (mg/L)	Maximum ICB/CCB[a] (mg/L)	Action Limit	1	4								
V			0.0066		0.0067	0.0067								

Sample Concentration units, unless otherwise noted: mg/L Associated Samples: 6-8

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (mg/L)	Maximum ICB/CCB[a] (mg/L)	Action Limit	8									
V			0.0067		0.0077									

Sample Concentration units, unless otherwise noted: mg/L Associated Samples: 1-3

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (mg/L)	Maximum ICB/CCB[a] (mg/L)	Action Limit	1									
Pb			0.0055		0.0053									

Sample Concentration units, unless otherwise noted: mg/L Associated Samples: 4-8 (>LOQ)

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (mg/L)	Maximum ICB/CCB[a] (mg/L)	Action Limit	No Qual's.									
Na			0.6575											

Samples with analyte concentrations within five times the associated ICB, CCB or PB concentration are listed above with the identifications from the Validation Completeness Worksheet. These sample results were qualified as not detected, "U".

Note : a - The listed analyte concentration is the highest ICB, CCB, or PB detected in the analysis of each element.

LDC #: 43824A4b

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: MG
2nd Reviewer: Q

METHOD: Trace metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤35% for soil samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
1	11/12	water	Ca		71 (87-113)		8	J/UJ/A (det)
	↓	↓	Fe		86 (87-115)		↓	(↓)
			Mg		76 (85-113)			(↓)

Comments:

MSD.4SW

LDC #: 43824A4b

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Trace metals (EPA SW 846 Method 6010/6020/7000)
An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (ug/L)	True (ug/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
	ICP (Low Level calibration)						
	ICP/MS (Low Level calibration)						
1324 ICV	ICP (Initial calibration)	Cd	503.5	500.0	101	101	Y
	ICP/MS (Initial calibration)						
1701 ICV	CVAA (Initial calibration)	Hg	2.0459	2.000	102	102	
2335 CCV	ICP (Continuing calibration)	Ag	465.17	500.0	93	93	
	ICP/MS (Continuing calibration)						
1901 CCV	CVAA (Continuing calibration)	Hg	1.9098	2.000	95	95	

ICP-MS TUNE	Calculation	Mass	Actual (Mean Counts / Axis)	Required (Counts / Axis)	Recalculated %RSD	Acceptable (Y/N)
	Mass Axis			± 0.1 AMU	NA	
	%RSD			≤ 5% RSD		

Comments:

LDC #: 43824A46

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$

Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$

Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$

Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (units)	True / D / SDR (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
–	ICP interference check	–	–	–	–	–	–
0005 LCS	Laboratory control sample	Cr	2.063 (mg/L)	2.0 (mg/L)	103	103	Y
0100 11	Matrix spike	Tl	(SSR-SR) 0.835 (mg/L)	0.80 (mg/L)	104	104	↓
0100/0105 11/12	Duplicate	Zn	2.122 (mg/L)	1.979 (mg/L)	7.0	7.0	↓
0055/0110 8	ICP serial dilution	Ca	109.5 (mg/L)	111.9 (mg/L)	2.2	2.2	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

TOTCLC.4SW

LDC #: 43824A46

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: MG
2nd reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
Y N N/A Are all detection limits below the CRDL?

Detected analyte results for #3, Mg were recalculated and verified using the following equation:

Concentration = (RD)(FV)(Dil) / (In. Vol.)

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

Recalculation:

$$\frac{(71.51\ mg/L)(0.050\ L)}{0.050\ L} = 71.51\ mg/L$$

#	Sample ID	Analyte	Reported Concentration (mg/L)	Calculated Concentration (mg/L)	Acceptable (Y/N)
1	3	Mg	72	72	Y
					↓
2	5	K	4.6	4.6	↓

Note: method 7470A is N.D. for all Level IV samples

RECALC.4SW

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Joliet Army Ammunition Plant

LDC Report Date: December 18, 2018

Parameters: Wet Chemistry

Validation Level: Level III & IV

Laboratory: Shealy Environmental Services, Inc.

Sample Delivery Group (SDG): TJ03033

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
JP-M11-GWMW335	TJ03033-011	Water	10/02/18
JP-M11-GWMW804	TJ03033-012	Water	10/02/18
JP-M11-GWMW805**	TJ03033-013**	Water	10/02/18
JP-M11-GWMW336	TJ03033-014	Water	10/02/18
JP-M11-GWMW334**	TJ03033-015**	Water	10/02/18
JP-M11-GWMW333	TJ03033-016	Water	10/02/18
JP-M11-GWMW803	TJ03033-017	Water	10/02/18
JP-M11-GWMW802	TJ03033-018	Water	10/02/18
JP-M1-GWMW107**	TJ03033-019**	Water	10/02/18
JP-M1-GWMW640**	TJ03033-020**	Water	10/02/18
JP-M11-GWMW803MS	TJ03033-017MS	Water	10/02/18
JP-M11-GWMW803MSD	TJ03033-017MSD	Water	10/02/18

**Indicates sample underwent Level IV validation

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Appendix B - 2017 Quality Assurance Project Plan Update, Long-Term Monitoring Plan (2017 QAPP; IEA/MWH JV, July 2017), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.1 (2017), and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Sulfate and Nitrate as Nitrogen by Environmental Protection Agency (EPA) SW 846 Method 9056A

All sample results were subjected to Level III data validation, which comprises an evaluation of quality control (QC) summary results. Samples appended with a double asterisk on the cover page were subjected to Level IV data validation, which is comprised of the QC summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. For JP-M11-GWMW803MS/MSD, no data were qualified for Sulfate percent recoveries (%R) outside the QC limits since the parent sample results were greater than 4X the spike concentration. Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

The laboratory has indicated that there were no duplicate (DUP) analyses specified for the samples in this SDG, and therefore duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

All sample result verifications were acceptable for samples which underwent Level IV validation. Raw data were not reviewed for Level III validation.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Joliet Army Ammunition Plant
Wet Chemistry - Data Qualification Summary - SDG TJ03033

No Sample Data Qualified in this SDG

Joliet Army Ammunition Plant
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG TJ03033

No Sample Data Qualified in this SDG

Joliet Army Ammunition Plant
Wet Chemistry - Field Blank Data Qualification Summary - SDG TJ03033

No Sample Data Qualified in this SDG

LDC #: 43824A6 **VALIDATION COMPLETENESS WORKSHEET** Date: 12-17-18

SDG #: TJ03033 Level III/IV Page: 1 of 1

Laboratory: Shealy Environmental Services, Inc. Reviewer: MG

2nd Reviewer:

METHOD: (Analyte) Sulfate, Nitrate-N (EPA SW846 Method 9056A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	N	
VI.	Matrix Spike/Matrix Spike Duplicates	A	MS/MSD (SO4-4x)
VII.	Duplicate sample analysis	N	
VIII.	Laboratory control samples	A	LCS
IX.	Field duplicates	N	
X.	Sample result verification	A	Not reviewed for Level III validation.
XI.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

** Indicates sample underwent Level IV validation

	Client ID	Lab ID	Matrix	Date
1	JP-M11-GWMW335	TJ03033-011	Water	10/02/18
2	JP-M11-GWMW804	TJ03033-012	Water	10/02/18
3	JP-M11-GWMW805**	TJ03033-013**	Water	10/02/18
4	JP-M11-GWMW336	TJ03033-014	Water	10/02/18
5	JP-M11-GWMW334**	TJ03033-015**	Water	10/02/18
6	JP-M11-GWMW333	TJ03033-016	Water	10/02/18
7	JP-M11-GWMW803	TJ03033-017	Water	10/02/18
8	JP-M11-GWMW802	TJ03033-018	Water	10/02/18
9	JP-M1-GWMW107**	TJ03033-019**	Water	10/02/18
10	JP-M1-GWMW640**	TJ03033-020**	Water	10/02/18
11	JP-M11-GWMW803MS	TJ03033-017MS	Water	10/02/18
12	JP-M11-GWMW803MSD	TJ03033-017MSD	Water	10/02/18
13				
14	PBW1			
15	PBW2			

Notes:

LDC #: 43824A6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [signature]

Method: Inorganics (EPA Method See cover)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	✓			
Were the proper number of standards used?	✓			
Were all initial calibration correlation coefficients ≥ 0.995?	✓			
Were all initial and continuing calibration verification %Rs within the 90-110% QC limits?	✓			
Were titrant checks performed as required? (Level IV only)			✓	
Were balance checks performed as required? (Level IV only)			✓	
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
IV. Matrix spike/Matrix spike duplicates and Duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.	✓			
Were the MS/MSD or duplicate relative percent differences (RPD) ≤ 20% for waters and ≤ 35% for soil samples? A control limit of ≤ CRDL(≤ 2X CRDL for soil) was used for samples that were ≤ 5X the CRDL, including when only one of the duplicate sample values were ≤ 5X the CRDL.	✓			
V. Laboratory control samples				
Was an LCS anaylzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% (85-115% for Method 300.0) QC limits?	✓			
VI. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	

LDC #: 43824A6

VALIDATION FINDINGS CHECKLIST

Reviewer: MG
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
VII. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
Were detection limits < RL?	✓			
VIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target analytes were detected in the field duplicates.			✓	
X. Field blanks				
Field blanks were identified in this SDG.		✓		
Target analytes were detected in the field blanks.			✓	

LDC #: 43824A6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: MG
2nd reviewer: [illegible]

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
1→8	W	pH TDS Cl F (NO$_3$) NO$_2$ (SO$_4$) PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
9, 10	↓	pH TDS Cl F NO$_3$ NO$_2$ (SO$_4$) PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
QC 11, 12	↓	pH TDS Cl F (NO$_3$) NO$_2$ (SO$_4$) PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____

Comments:

LDC #: 43824A6

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method see cover

The correlation coefficient (r) for the calibration of SO4 was recalculated. Calibration date: 8-29-18

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

%R = Found / True x 100 Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution
True = concentration of each analyte in the ICV or CCV source

Type of Analysis	Analyte	Standard ID	Conc. Found (units)	Area True (units)	Recalculated r or %R	Reported r or %R	Acceptable (Y/N)
Initial calibration	SO4	Blank	0.5 (mg/L)	58715	r^2=1.000	r^2=1.000	Y
		Standard 1	1.0 ( )	135812			
		Standard 2	5.0 ( )	796632			
		Standard 3	10.0 ( )	1390940			
		Standard 4	25.0 ( )	3720346			
		Standard 5	50.0 ( )	7230076			
		Standard 6	100.0 ( )	15026875			
		Standard 7	200.0 ( )	30111857			
Calibration verification	NO3-N	0613 CCV	0.925 (mg/L)	1.0 (mg/L)	-7.5 %D	-7.5 %D	
Calibration verification	SO4	1107 CCV	25.76 (mg/L)	25.0 (mg/L)	3.0 %D	3 %D	
Calibration verification	–	–	–	–	–	–	–

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 43824A6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Inorganics, Method See cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

%R = Found / True x 100 Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

RPD = |S-D| / (S+D)/2 x 100 Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	Found / S (units)	True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
0652 LCS	Laboratory control sample	NO_3-N	0.768 (mg/L)	0.80 (mg/L)	96	96	Y
0937 11	Matrix spike sample	NO_3-N	(SSR-SR) 0.771 (mg/L)	0.80 (mg/L)	96	91	↓
0937/1031 11/12	Duplicate sample	SO_4	99.00 (mg/L)	97.37 (mg/L)	1.7	1.6	↓

Comments: Refer to appropriate worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 43824A6

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: MG
2nd reviewer:

METHOD: Inorganics, Method See cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".
Y N N/A Have results been reported and calculated correctly?
Y N N/A Are results within the calibrated range of the instruments?
Y N N/A Are all detection limits below the CRQL?

Compound (analyte) results for # 3, SO_4 reported with a positive detect were recalculated and verified using the following equation:

Concentration = Recalculation:

M1 = 138173
B = 0.043539
dil = 5x

$$SO_4 = \left(\frac{9786072}{138173} + 0.043539\right) \times 5 = 354.34 \text{ mg/L}$$

#	Sample ID	Analyte	Reported Concentration (mg/L)	Calculated Concentration (mg/L)	Acceptable (Y/N)
1	3	SO_4	350	350	Y
2	5	SO_4	160	160	
3	9	SO_4	9800	9800	
4	10	SO_4	3800	3800	

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Joliet Army Ammunition Plant

LDC Report Date: December 20, 2018

Parameters: Explosives

Validation Level: Level III & IV

Laboratory: Shealy Environmental Services, Inc.

Sample Delivery Group (SDG): TJ03033

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
JP-L1-GWMW173	TJ03033-001	Water	10/01/18
JP-L1-GWMW174	TJ03033-002	Water	10/01/18
JP-L1-GWMW131**	TJ03033-003**	Water	10/01/18
JP-L1-GWWES3**	TJ03033-004**	Water	10/01/18
JP-L1-GWWES1**	TJ03033-005**	Water	10/01/18
JP-L1-GW550	TJ03033-006	Water	10/01/18
JP-L14-GWMW511	TJ03033-007	Water	10/01/18
JP-L14-GWMW512	TJ03033-008	Water	10/01/18
JP-L14-GWH7	TJ03033-009	Water	10/01/18
JP-M11-GWMW335	TJ03033-011	Water	10/02/18
JP-M11-GWMW804	TJ03033-012	Water	10/02/18
JP-M11-GWMW805**	TJ03033-013**	Water	10/02/18
JP-M11-GWMW336	TJ03033-014	Water	10/02/18
JP-M11-GWMW334**	TJ03033-015**	Water	10/02/18
JP-M11-GWMW333	TJ03033-016	Water	10/02/18
JP-M11-GWMW803	TJ03033-017	Water	10/02/18
JP-M11-GWMW802	TJ03033-018	Water	10/02/18
JP-L1-GWMW173MS	TJ03033-001MS	Water	10/01/18
JP-L1-GWMW173MSD	TJ03033-001MSD	Water	10/01/18

**Indicates sample underwent Level IV validation

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Appendix B - 2017 Quality Assurance Project Plan Update, Long-Term Monitoring Plan (2017 QAPP; IEA/MWH JV, July 2017), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.1 (2017), and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Explosives by Environmental Protection Agency (EPA) SW 846 Method 8330A

All sample results were subjected to Level III data validation, which comprises an evaluation of quality control (QC) summary results. Samples appended with a double asterisk on the cover page were subjected to Level IV data validation, which is comprised of the QC summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0% for all compounds.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 15.0% for all compounds.

Retention time windows were established as required by the method for samples which underwent Level IV validation. Raw data were not reviewed for Level III validation.

III. Continuing Calibration

Continuing calibration was performed at required frequencies.

The percent differences (%D) were less than or equal to 15.0% for all compounds.

Retention times of all compounds in the calibration standards were within the established retention time windows for samples which underwent Level IV validation. Raw data were not reviewed for Level III validation.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Compound Quantitation

All compound quantitations met validation criteria for samples which underwent Level IV validation.

The sample results for detected compounds from the two columns were within 40% relative percent difference (RPD) with the following exceptions:

Sample	Compound	RPD	Flag	A or P
JP-L1-GWMW173	HMX	57.72	J (all detects)	A
JP-L1-GWWES3**	RDX	167.41	J (all detects)	A
JP-L1-GWWES1**	2,4-Dinitrotoluene 2,6-Dinitrotoluene	49.35 94.41	J (all detects) J (all detects)	A
JP-L14-GWH7	RDX	58.08	J (all detects)	A

Raw data were not reviewed for Level III validation.

XI. Target Compound Identifications

All target compound identifications met validation criteria for samples which underwent Level IV validation. Raw data were not reviewed for Level III validation.

XII. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to RPDs between two columns, data were qualified as estimated in four samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Joliet Army Ammunition Plant
Explosives - Data Qualification Summary - SDG TJ03033

Sample	Compound	Flag	A or P	Reason
JP-L1-GWMW173	HMX	J (all detects)	A	Compound quantitation (RPD between two columns)
JP-L1-GWWES3** JP-L14-GWH7	RDX	J (all detects)	A	Compound quantitation (RPD between two columns)
JP-L1-GWWES1**	2,4-Dinitrotoluene 2,6-Dinitrotoluene	J (all detects) J (all detects)	A	Compound quantitation (RPD between two columns)

Joliet Army Ammunition Plant
Explosives - Laboratory Blank Data Qualification Summary - SDG TJ03033

No Sample Data Qualified in this SDG

Joliet Army Ammunition Plant
Explosives - Field Blank Data Qualification Summary - SDG TJ03033

No Sample Data Qualified in this SDG

LDC #: 43824A40 **VALIDATION COMPLETENESS WORKSHEET** Date: 12/18/18

SDG #: TJ03033 Level III/IV Page: 1 of 2

Laboratory: Shealy Environmental Services, Inc. Reviewer: [illegible]

2nd Reviewer: [illegible]

METHOD: HPLC Explosives (EPA SW 846 Method 8330A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A/A	
II.	Initial calibration/ICV	A/A	% RSD ≤ 20 ICV ≤ 15
III.	Continuing calibration	A	CCV ≤ 15
IV.	Laboratory Blanks	A	
V.	Field blanks	N	
VI.	Surrogate spikes	A	
VII.	Matrix spike/Matrix spike duplicates	A	
VIII.	Laboratory control samples	A	LCS
IX.	Field duplicates	N	
X.	Compound quantitation RL/LOQ/LODs	SW	Not reviewed for Level III validation.
XI.	Target compound identification	A	Not reviewed for Level III validation.
XII.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

** Indicates sample underwent Level IV validation

	Client ID	Lab ID	Matrix	Date
+ 1	JP-L1-GWMW173	TJ03033-001	Water	10/01/18
2	JP-L1-GWMW174	TJ03033-002	Water	10/01/18
+ 3	JP-L1-GWMW131**	TJ03033-003**	Water	10/01/18
+ 4	JP-L1-GWWES3**	TJ03033-004**	Water	10/01/18
+ 5	JP-L1-GWWES1**	TJ03033-005**	Water	10/01/18
6	JP-L1-GW~~CSO~~ SSO	TJ03033-006	Water	10/01/18
+ 7	JP-~~44~~ LH-GWMW511	TJ03033-007	Water	10/01/18
+ 8	JP-~~44~~ LH-GWMW512	TJ03033-008	Water	10/01/18
+ 9	JP-~~44~~ LH-GWH7	TJ03033-009	Water	10/01/18
10	JP-M11-GWMW335	TJ03033-011	Water	10/02/18
11	JP-M11-GWMW804	TJ03033-012	Water	10/02/18
12	JP-M11-GWMW805**	TJ03033-013**	Water	10/02/18
13	JP-M11-GWMW336	TJ03033-014	Water	10/02/18
14	JP-M11-GWMW334**	TJ03033-015**	Water	10/02/18
15	JP-M11-GWMW333	TJ03033-016	Water	10/02/18
16	JP-M11-GWMW803	TJ03033-017	Water	10/02/18

LDC #: 43824A40 **VALIDATION COMPLETENESS WORKSHEET** Date: 12/18/18

SDG #: TJ03033 Level III/IV Page: 2 of 2

Laboratory: Shealy Environmental Services, Inc. Reviewer: FT

2nd Reviewer:

METHOD: HPLC Explosives (EPA SW 846 Method 8330A)

	Client ID	Lab ID	Matrix	Date
17	JP-M11-GWMW802	TJ03033-018	Water	10/02/18
18	JP-L1-GWMW173MS	TJ03033-001MS	Water	10/01/18
19	JP-L1-GWMW173MSD	TJ03033-001MSD	Water	10/01/18
20				
21				
22				
23				
24				

Notes:

	85439						

LDC #: 43824A40

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Method: ___ GC / HPLC

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
IIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20%?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥0.990?			✓	
Were the RT windows properly established?	✓			
IIb. Initial calibration verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ ~~20%~~ 15%?	✓			
III. Continuing calibration				
Was a continuing calibration analyzed daily?	✓			
Were all percent differences (%D) ≤ ~~20%~~ 15%?	✓			
Were all the retention times within the acceptance windows?	✓			
IV. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks?		✓		
V. Field Blanks				
Were field blanks identified in this SDG?		✓		
Were target compounds detected in the field blanks?			✓	
VI. Surrogate spikes				
Were all surrogate percent recovery (%R) within the QC limits?	✓			
If the percent recovery (%R) of one or more surrogates was outside QC limits, was a reanalysis performed to confirm %R?			✓	
If any %R was less than 10 percent, was a reanalysis performed to confirm %R?			✓	
VII. Matrix spike/Matrix spike duplicates				
Were matrix spike (MS) and matrix spike duplicate (MSD) analyzed in this SDG?	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?	✓			
VIII. Laboratory control samples				
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			

LDC #: 43824A40

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: [illegible]

Validation Area	Yes	No	NA	Findings/Comments
IX. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target compounds detected in the field duplicates?			✓	
X. Compound quantitation				
Did the laboratory LOQs/RLs meet the QAPP LOQs/RLs?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Target compound identification				
Were the retention times of reported detects within the RT windows?	✓			
XIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: ____GC ___✓___HPLC

8310	8330	8151	8141	8141(Con't)	8021B
A. Acenaphthene	A. HMX	A. 2,4-D	A. Dichlorvos	X. EPN	V. Benzene
B. Acenaphthylene	B. RDX	B. 2,4-DB	B. Mevinphos	Y. Azinphos-methyl	CC. Toluene
C. Anthracene	C. 1,3,5-Trinitrobenzene	C. 2,4,5-T	C. Demeton-O	Z. Coumaphos	EE. Ethyl Benzene
D. Benzo(a)anthracene	D. 1,3-Dinitrobenzene	D. 2,4,5-TP	D. Demeton-S	AA. Parathion	SSS. O-Xylene
E. Benzo(a)pyrene	E. Tetryl	E. Dinoseb	E. Ethoprop	BB. Trichloronate	RRR. MP-Xylene
F. Benzo(b)fluoranthene	F. Nitrobenzene	F. Dichlorprop	F. Naled	CC. Trichlorinate	GG. Total Xylene
G. Benzo(g,h,i)perylene	G. 2.4.6-Trinitrotoluene	G. Dicamba	G. Sulfotep	DD. Trifluralin	
H. Benzo(k)fluoranthene	H. 4-Amino-2,6-dinitrotoluene	H. Dalapon	H. Phorate	EE. Def	**8315A**
I. Chrysene	I. 2-Amino-4,6-dinitrotoluene	I. MCPP	I. Dimethoate	FF. Prowl	A. Formaldehyde
J. Dibenz(a,h)anthracene	J. 2,4-Dinitrotoluene	J. MCPA	J. Diazinon	GG. Ethion	B. Acetaldehyde
K. Fluoranthene	K. 2,6-Dinitrotoluene	K. Pentachlorophenol	K. Disulfoton	HH. Famphur	C. Benzaldehyde
L. Fluorene	L. 2-Nitrotoluene	L. 2,4,5-TP (silvex)	L. Parathion-methyl	II. Phosmet	D. Butyraldehyde
M. Indeno(1,2,3-cd)pyrene	M. 3-Nitrotoluene	M. Silvex	M. Ronnel	JJ. Tetrachlorvinphos	
N. Naphthalene	N. 4-Nitrotoluene	N.	N. Malathion	KK. Demeton (total)	
O. Phenanthrene	O. Nitroglycerin	O.	O. Chlorpyrifos		
P. Pyrene	P. Picric acid	P.	P. Fenthion		
Q.	Q. 2,4-Dinitrophenol	Q.	Q. Parathion-ethyl		
R.	R. 3,5-Dinitroaniline		R. Trichlornate		
S.	S. 2-Nitrophenol		S. Merphos		
	T. 4-Nitrophenol		T. Stirofos		
	U. Picramic acid		U. Tokuthion		
	V. PETN		V. Fensulfothion		
			W. Bolstar		

Notes:_____

_____

LDC #: 43824A40

VALIDATION FINDINGS WORKSHEET
Compound Quantitation and Reported CRQLs

Reviewer: FT
2nd Reviewer: [illegible]

METHOD: __ GC ✓ __ HPLC

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Level IV/D Only

Y N N/A Were CRQLs adjusted for sample dilutions, dry weight factors, etc.?

Y N N/A Did the reported results for detected target compounds agree within 10.0% of the recalculated results?

#	Associated Samples	Compound Name	% RPD Bet 2 col Findings ≤40	Qualifications
	1	A	57.72	J dw /Δ
	4	B	167.41	↓
	5	J	49.35	↓
		K	94.41	↓
	9	B	58.08	↓

Comments: See sample calculation verification worksheet for recalculations

LDC #: K3824A40

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: HPLC Explosives 8330~~B~~ A

The calibration factors (CF), average CF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

CF = A/C
average CF = sum of the CF/number of standards
%RSD = 100 * (S/X)

Where:
A = Area of compound
C = Concentration of compound
S = Standard deviation of calibration factors
X = Mean of calibration factors

#	Standard ID	Calibration Date	Compound	Reported 4 ng	Recalculated 4 ng	Reported Average CF (Initial)	Recalculated Average CF (Initial)	Reported %RSD	Recalculated %RSD
1	ICAL	10/9/2018	HMX	646	646	672	672	14.0	14.0
	LC01	Acclaim E2	1,3,5-TNB	1732	1732	1822	1822	8.4	8.4

LDC #: 43824A4D

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: HPLC Explosives 8330~~B~~ A

The calibration factors (CF), average CF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

CF = A/C
average CF = sum of the CF/number of standards
%RSD = 100 * (S/X)

Where:
A = Area of compound
C = Concentration of compound
S = Standard deviation of calibration factors
X = Mean of calibration factors

#	Standard ID	Calibration Date	Compound	Reported 60 ng	Recalculated 60 ng	Reported Average CF (Initial)	Recalculated Average CF (Initial)	Reported %RSD	Recalculated %RSD
1	ICAL	10/10/2018	HMX	2069	2069	2009	2009	3.4	3.4
	LC02	C18	1,3,5-TNB	5326	5326	5406	5406	2.5	2.5

LDC #: 43824A40

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer:

METHOD: GC _____ HPLC ✓

The percent difference (%D) of the initial calibration average Calibration Factors (CF) and the continuing calibration CF were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. CF -CF)/ave.CF

Where: ave. CF = initial calibration average CF
CF = continuing calibration CF
A = Area of compound
C = Concentration of compound

#	Standard ID	Calibration Date	Compound	Average CF(ICAL)/ CCV Conc.	Reported CF/ Conc. CCV	Recalculated CF/ Conc. CCV	Reported %D	Recalculated %D
1	ICV 2200	10/9/18 Acclaim E2	HMX	100	87.748	87.748	12.3	12.3
			1,3,5 - TNB	100	94.148	94.148	5.9	5.9
2	CCV 0713	10/10/18 Acclaim E2	↓	672	620	620	7.7	7.7
			↓	1822	1775	1775	2.6	2.6
3	CCV 0943	10/13/18 Acclaim E2	↓	↓	627	627	6.6	6.6
			↓		1792	1792	1.7	1.7
4	CCV 0959	10/12/18 618	↓	2009	2098	2098	4.4	4.4
			↓	5406	5345	5345	1.1	1.1

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 43824A4U

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Page: 1 of 1
Reviewer: FT
2nd reviewer:

METHOD: __ GC ✓ HPLC

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 4

Surrogate	Column/Detector	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
				Reported	Recalculated	
1,2 - DNB	C18	10	9.8568	99	99	0

Sample ID: _____

Surrogate	Column/Detector	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
				Reported	Recalculated	

	Surrogate Compound		Surrogate Compound		Surrogate Compound		Surrogate Compound		Surrogate Compound
A	Chlorobenzene (CBZ)	G	Octacosane	M	Benzo(e)Pyrene	S	1-Chloro-3-Nitrobenzene	Y	Tetrachloro-m- xylene
B	4-Bromofluorobenzene (BFB)	H	Ortho-Terphenyl	N	Terphenyl-D14	T	3,4-Dinitrotoluene	Z	2-Bromonaphthalene
C	a,a,a-Trifluorotoluene	I	Fluorobenzene (FBZ)	O	Decachlorobiphenyl (DCB)	U	Tripentyltin	AA	Chloro-octadecane
D	Bromochlorobenene	J	n-Triacontane	P	1-methylnaphthalene	V	Tri-n-propyltin	BB	2,4-Dichlorophenylacetic acid
E	1,4-Dichlorobutane	K	Hexacosane	Q	Dichlorophenyl Acetic Acid (DCAA)	W	Tributyl Phosphate	CC	2,5-Dibromotoluene
F	1,4-Difluorobenzene (DFB)	L	Bromobenzene	R	4-Nitrophenol	X	Triphenyl Phosphate		

LDC #: 83 43824 A40

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer:

METHOD: __ GC ✓ HPLC

The percent recoveries (%R) and relative percent differences (RPD) of the matrix spike and matrix spike duplicate were recalculated for the compounds identified below using the following calculation:

%Recovery = 100 * (SSC - SC)/SA

RPD =(({SSCMS - SSCMSD} * 2) / (SSCMS + SSCMSD))*100

Where SSC = Spiked sample concentration; SC = Sample concentration; SA = Spike added; MS = Matrix spike; MSD = Matrix spike duplicate

MS/MSD samples: 18 + 19

Compound		Spike Added (ug/L)		Sample Conc. (ug/L)	Spike Sample Concentration (ug/L)		Matrix spike Percent Recovery		Matrix Spike Duplicate Percent Recovery		MS/MSD RPD	
		MS	MSD	---	MS	MSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalc.
Gasoline	(8015)											
Diesel	(8015)											
Benzene	(8021B)											
Methane	(RSK-175)											
2,4-D	(8151)											
Dinoseb	(8151)											
Naphthalene	(8310)											
Anthracene	(8310)											
HMX	(8330)	20	20	0.68	17	16	79	79	76	76	3.7	3.7
2,4,6-Trinitrotoluene	(8330)	20	20	5.0	24	23	94	94	90	90	2.9	2.9
Phorate	(8141A)											
Malathion	(8141A)											
Formaldehyde	(8315A)											

Comments: Refer to Matrix Spike/Matrix Spike Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 43824A40

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: ___ GC ✓ HPLC

The percent recoveries (%R) and relative percent differences (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the compounds identified below using the following calculation:

%Recovery = 100 * (SSC/SA)
RPD =(({SSCLCS - SSCLCSD} * 2) / (SSCLCS + SSCLCSD))*100

Where SSC = Spiked sample concentration
LCS = Laboratory Control Sample
SA = Spike added
LCSD = Laboratory Control Sample duplicate

LCS/LCSD samples: 85439-LCS

Compound	Spike Added (ug/L)		Spike Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalc.
Gasoline (8015)										
Diesel (8015)										
Benzene (8021B)										
Methane (RSK-175)										
2,4-D (8151)										
Dinoseb (8151)										
Naphthalene (8310)										
Anthracene (8310)										
HMX (8330)	10	NA	7.6	NA	76	76				
2,4,6-Trinitrotoluene (8330)	10	↓	9.1	↓	91	91				
Phorate (8141A)										
Malathion (8141A)										
Formaldehyde (8315A)										

Comments: Refer to Laboratory Control Sample/Laboratory Control Sample Duplicate findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 43824A4D

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer:

METHOD: GC

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

$$\text{Concentration} = \frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$$

A_x	=	Area of the characteristic ion (EICP) for the compound to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup

Example:

Sample I.D. #3, 1,3,5-TNB

$$\text{Conc.} = \frac{(1062622)(10)(5)(1000}{(1822)(1000)(20)}$$

= 1458 ug/L

#	Sample ID	Compound	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Qualification
	#3	1,3,5-TNB	1400	1458	

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Joliet Army Ammunition Plant

LDC Report Date: December 18, 2018

Parameters: Sulfate

Validation Level: Level III

Laboratory: Shealy Environmental Services, Inc.

Sample Delivery Group (SDG): TJ06011

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
JP-M1-GWMW231	TJ06011-001	Water	10/03/18
JP-M1-GWMW999	TJ06011-002	Water	10/03/18
JP-M1-GWMW646	TJ06011-003	Water	10/03/18
JP-M1-GWMW645	TJ06011-004	Water	10/03/18
JP-M1-GWMW649	TJ06011-005	Water	10/03/18
JP-M1-GWMW641	TJ06011-006	Water	10/03/18
JP-M1-SW709	TJ06011-007	Water	10/03/18
JP-M1-GWMW642	TJ06011-008	Water	10/03/18
JP-M1-GWMW643	TJ06011-009	Water	10/03/18
JP-M1-GWMW644	TJ06011-010	Water	10/03/18

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Appendix B - 2017 Quality Assurance Project Plan Update, Long-Term Monitoring Plan (2017 QAPP; IEA/MWH JV, July 2017), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.1 (2017), and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Sulfate by Environmental Protection Agency (EPA) SW 846 Method 9056A

All sample results were subjected to Level III data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VII. Duplicate Sample Analysis

The laboratory has indicated that there were no duplicate (DUP) analyses specified for the samples in this SDG, and therefore duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

IX. Field Duplicates

Samples JP-M1-GWMW231 and JP-M1-GWMW999 were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration (mg/L)		RPD (Limits)	Difference (Limits)	Flag	A or P
	JP-M1-GWMW231	JP-M1-GWMW999				
Sulfate	33000	33000	0 (≤25)	-	-	-

X. Sample Result Verification

Raw data were not reviewed for Level III validation.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Joliet Army Ammunition Plant
Sulfate - Data Qualification Summary - SDG TJ06011

No Sample Data Qualified in this SDG

Joliet Army Ammunition Plant
Sulfate - Laboratory Blank Data Qualification Summary - SDG TJ06011

No Sample Data Qualified in this SDG

Joliet Army Ammunition Plant
Sulfate - Field Blank Data Qualification Summary - SDG TJ06011

No Sample Data Qualified in this SDG

LDC #: 43824B6 **VALIDATION COMPLETENESS WORKSHEET** Date: 12-17-18

SDG #: TJ06011 Level III Page: 1 of 1

Laboratory: Shealy Environmental Services, Inc. Reviewer: MG

2nd Reviewer:

METHOD: (Analyte) Sulfate (EPA SW846 Method 9056A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	N	
VI.	Matrix Spike/Matrix Spike Duplicates	N	client specified
VII.	Duplicate sample analysis	N	
VIII.	Laboratory control samples	A	LCS
IX.	Field duplicates	SW	D=1+2
X.	Sample result verification	N	
XI.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	JP-M1-GWMW231	TJ06011-001	Water	10/03/18
2	JP-M1-GWMW999	TJ06011-002	Water	10/03/18
3	JP-M1-GWMW646	TJ06011-003	Water	10/03/18
4	JP-M1-GWMW645	TJ06011-004	Water	10/03/18
5	JP-M1-GWMW649	TJ06011-005	Water	10/03/18
6	JP-M1-GWMW641	TJ06011-006	Water	10/03/18
7	JP-M1-SW709	TJ06011-007	Water	10/03/18
8	JP-M1-GWMW642	TJ06011-008	Water	10/03/18
9	JP-M1-GWMW643	TJ06011-009	Water	10/03/18
10	JP-M1-GWMW644	TJ06011-010	Water	10/03/18
11				
12	PBW1			
13	PBW2			
14	PBW3			
15	PBW4			

Notes:

LDC#: 43824B6

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd Reviewer:

Inorganics, Method: 9056A

Analyte	Concentration (mg/L)		RPD (≤25)	Difference	Limits	Qualification (Parent only)
	1	2				
Sulfate	33000	33000	0			

V:\FIELD DUPLICATES\Field Duplicates\FD_inorganic\2018\43824B6.wpd

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Joliet Army Ammunition Plant

LDC Report Date: December 19, 2018

Parameters: Explosives

Validation Level: Level III

Laboratory: Shealy Environmental Services, Inc.

Sample Delivery Group (SDG): TJ06011

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
JP-L2-GWMW620	TJ06011-011	Water	10/04/18
JP-L2-GWMW621	TJ06011-012	Water	10/04/18
JP-L2-GWMW404	TJ06011-013	Water	10/04/18
JP-L2-GWMW998	TJ06011-014	Water	10/04/18
JP-L2-SW555	TJ06011-015	Water	10/04/18
JP-M6-GWMW652	TJ06011-016	Water	10/04/18
JP-M6-GWMW654	TJ06011-017	Water	10/04/18
JP-M6-GWMW313	TJ06011-018	Water	10/04/18
JP-M6-GWMW123R	TJ06011-019	Water	10/04/18
JP-M6-GWMW162R	TJ06011-020	Water	10/04/18
JP-M6-GWMW319	TJ06011-021	Water	10/04/18
JP-M6-GWMW318	TJ06011-022	Water	10/04/18
JP-L2-GWMW621MS	TJ06011-012MS	Water	10/04/18
JP-L2-GWMW621MSD	TJ06011-012MSD	Water	10/04/18

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Appendix B - 2017 Quality Assurance Project Plan Update, Long-Term Monitoring Plan (2017 QAPP; IEA/MWH JV, July 2017), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.1 (2017), and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Explosives by Environmental Protection Agency (EPA) SW 846 Method 8330A

All sample results were subjected to Level III data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0% for all compounds.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 15.0% for all compounds.

III. Continuing Calibration

Continuing calibration was performed at required frequencies.

The percent differences (%D) were less than or equal to 15.0% for all compounds.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits with the following exceptions:

Sample	Detector	Surrogate	%R (Limits)	Affected Compound	Flag	A or P
JP-M6-GWMW318	C18	1,2-Dinitrobenzene	122 (83-119)	All compounds	J (all detects)	P

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

IX. Field Duplicates

Samples JP-L2-GWMW404 and JP-L2-GWMW998 were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Compound	Concentration (ug/L)		RPD (Limits)	Difference (Limits)	Flag	A or P
	JP-L2-GWMW404	JP-L2-GWMW998				
HMX	14	14	0 (≤25)	-	-	-
RDX	28	28	0 (≤25)	-	-	-

X. Compound Quantitation

The sample results for detected compounds from the two columns were within 40% relative percent difference (RPD) with the following exceptions:

Sample	Compound	RPD	Flag	A or P
JP-M6-GWMW123R	2,4,6-Trinitrotoluene	94.11	J (all detects)	A
JP-M6-GWMW318	2-Nitrotoluene	177.91	J (all detects)	A

Raw data were not reviewed for Level III validation.

XI. Target Compound Identifications

Raw data were not reviewed for Level III validation.

XII. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to surrogate %R and RPDs between two columns, data were qualified as estimated in two samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Joliet Army Ammunition Plant
Explosives - Data Qualification Summary - SDG TJ06011

Sample	Compound	Flag	A or P	Reason
JP-M6-GWMW318	All compounds	J (all detects)	P	Surrogates (%R)
JP-M6-GWMW123R	2,4,6-Trinitrotoluene	J (all detects)	A	Compound quantitation (RPD between two columns)
JP-M6-GWMW318	2-Nitrotoluene	J (all detects)	A	Compound quantitation (RPD between two columns)

Joliet Army Ammunition Plant
Explosives - Laboratory Blank Data Qualification Summary - SDG TJ06011

No Sample Data Qualified in this SDG

Joliet Army Ammunition Plant
Explosives - Field Blank Data Qualification Summary - SDG TJ06011

No Sample Data Qualified in this SDG

LDC #: 43824B40 **VALIDATION COMPLETENESS WORKSHEET** Date: 12/18/18

SDG #: TJ06011 Level III Page: 1 of 1

Laboratory: Shealy Environmental Services, Inc. Reviewer: EJ

2nd Reviewer: [illegible]

METHOD: HPLC Explosives (EPA SW 846 Method 8330A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	Initial calibration/ICV	A / A	% RSD ≤ 20 ICV ≤ 15
III.	Continuing calibration	A	CCV ≤ 15
IV.	Laboratory Blanks	A	
V.	Field blanks	N	
VI.	Surrogate spikes	SW	
VII.	Matrix spike/Matrix spike duplicates	A	
VIII.	Laboratory control samples	A	LCS
IX.	Field duplicates	SW	D = 3, 4
X.	Compound quantitation RL/LOQ/LODs	SW	
XI.	Target compound identification	N	
XII.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	JP-L2-GWMW620	TJ06011-011	Water	10/04/18
2	JP-L2-GWMW621	TJ06011-012	Water	10/04/18
3	JP-L2-GWMW404 D	TJ06011-013	Water	10/04/18
4	JP-L2-GWMW998 / D	TJ06011-014	Water	10/04/18
5	JP-L2-SW555	TJ06011-015	Water	10/04/18
6	JP-M6-GWMW652	TJ06011-016	Water	10/04/18
7	JP-M6-GWMW654	TJ06011-017	Water	10/04/18
8	JP-M6-GWMW313	TJ06011-018	Water	10/04/18
9	JP-M6-GWMW123R	TJ06011-019	Water	10/04/18
10	JP-M6-GWMW162R	TJ06011-020	Water	10/04/18
11	JP-M6-GWMW319	TJ06011-021	Water	10/04/18
12	JP-M6-GWMW318	TJ06011-022	Water	10/04/18
13	JP-L2-GWMW621MS	TJ06011-012MS	Water	10/04/18
14	JP-L2-GWMW621MSD	TJ06011-012MSD	Water	10/04/18
15				
16	85878-MB			

VALIDATION FINDINGS WORKSHEET

METHOD: ____GC ___/HPLC

8310	8330	8151	8141	8141(Con't)	8021B
A. Acenaphthene	A. HMX	A. 2,4-D	A. Dichlorvos	X. EPN	V. Benzene
B. Acenaphthylene	B. RDX	B. 2,4-DB	B. Mevinphos	Y. Azinphos-methyl	CC. Toluene
C. Anthracene	C. 1,3,5-Trinitrobenzene	C. 2,4,5-T	C. Demeton-O	Z. Coumaphos	EE. Ethyl Benzene
D. Benzo(a)anthracene	D. 1,3-Dinitrobenzene	D. 2,4,5-TP	D. Demeton-S	AA. Parathion	SSS. O-Xylene
E. Benzo(a)pyrene	E. Tetryl	E. Dinoseb	E. Ethoprop	BB. Trichloronate	RRR. MP-Xylene
F. Benzo(b)fluoranthene	F. Nitrobenzene	F. Dichlorprop	F. Naled	CC. Trichlorinate	GG. Total Xylene
G. Benzo(g,h,i)perylene	G. 2.4.6-Trinitrotoluene	G. Dicamba	G. Sulfotep	DD. Trifluralin	
H. Benzo(k)fluoranthene	H. 4-Amino-2,6-dinitrotoluene	H. Dalapon	H. Phorate	EE. Def	**8315A**
I. Chrysene	I. 2-Amino-4,6-dinitrotoluene	I. MCPP	I. Dimethoate	FF. Prowl	A. Formaldehyde
J. Dibenz(a,h)anthracene	J. 2,4-Dinitrotoluene	J. MCPA	J. Diazinon	GG. Ethion	B. Acetaldehyde
K. Fluoranthene	K. 2,6-Dinitrotoluene	K. Pentachlorophenol	K. Disulfoton	HH. Famphur	C. Benzaldehyde
L. Fluorene	L. 2-Nitrotoluene	L. 2,4,5-TP (silvex)	L. Parathion-methyl	II. Phosmet	D. Butyraldehyde
M. Indeno(1,2,3-cd)pyrene	M. 3-Nitrotoluene	M. Silvex	M. Ronnel	JJ. Tetrachlorvinphos	
N. Naphthalene	N. 4-Nitrotoluene	N.	N. Malathion	KK. Demeton (total)	
O. Phenanthrene	O. Nitroglycerin	O.	O. Chlorpyrifos		
P. Pyrene	P. Picric acid	P.	P. Fenthion		
Q.	Q. 2,4-Dinitrophenol	Q.	Q. Parathion-ethyl		
R.	R. 3,5-Dinitroaniline		R. Trichlornate		
S.	S. 2-Nitrophenol		S. Merphos		
	T. 4-Nitrophenol		T. Stirofos		
	U. Picramic acid		U. Tokuthion		
	V. PETN		V. Fensulfothion		
			W. Bolstar		

Notes:_____

LDC #: 43824B40

VALIDATION FINDINDS WORKSHEET

Surrogate Recovery

Reviewer: FT

2nd Reviewer: [signature]

METHOD: __ GC ✓ HPLC

Are surrogates required by the method? Yes____ or No____.

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Were surrogates spiked into all samples and blanks?

Y (N) N/A Did all surrogate recoveries (%R) meet the QC limits?

#	Sample ID	Detector/ Column	Surrogate Compound	%R (Limits)	Qualifications
	12	C18	DD	122 (83-119)	J dets / P ND + Det
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	

	Surrogate Compound		Surrogate Compound		Surrogate Compound		Surrogate Compound		
A	Chlorobenzene (CBZ)	G	Octacosane	M	Benzo(e)Pyrene	S	1-Chloro-3-Nitrobenzene	Y	Tetrachloro-m- xylene
B	4-Bromofluorobenzene (BFB)	H	Ortho-Terphenyl	N	Terphenyl-D14	T	3,4-Dinitrotoluene	Z	2-Bromonaphthalene
C`	a,a,a-Trifluorotoluene	I	Fluorobenzene (FBZ)	O	Decachlorobiphenyl (DCB)	U	Tripentyltin	AA	Chloro-octadecane
D	Bromochlorobenene	J	n-Triacontane	P	1-methylnaphthalene	V	Tri-n-propyltin	BB	2,4-Dichlorophenylacetic acid
E	1,4-Dichlorobutane	K	Hexacosane	Q	Dichlorophenyl Acetic Acid (DCAA)	W	Tributyl Phosphate	CC	2,5-Dibromotoluene
F	1,4-Difluorobenzene (DFB)	L	Bromobenzene	R	4-Nitrophenol	X	Triphenyl Phosphate		

LDC#: 43824B40

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Page: 1 of 1
Reviewer: FZ
2nd Reviewer: [illegible]

METHOD: HPLC 8330A

Compound	Concentration (ug/L)		(≤20) 15 RPD	Difference	Limits	Qual
	3	4				
A	14	14	0			
B	28	28	0			

V:\FIELD DUPLICATES\Field Duplicates\FD_Organics\2018\43824B40.wpd

LDC #: 43824B40

VALIDATION FINDINGS WORKSHEET
Compound Quantitation and Reported CRQLs

Page: 1 of
Reviewer: FT
2nd Reviewer:

METHOD: ___ GC ✓ HPLC

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Level IV/D Only

Y N N/A Were CRQLs adjusted for sample dilutions, dry weight factors, etc.?

Y N N/A Did the reported results for detected target compounds agree within 10.0% of the recalculated results?

#	Associated Samples	Compound Name	% RPD Bet 2 col ≤ 40 Findings	Qualifications
	9	G	94.11	Jdet /A
	12	L	177.91	Jdet /A

Comments: See sample calculation verification worksheet for recalculations

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Joliet Army Ammunition Plant

LDC Report Date: December 18, 2018

Parameters: Sulfate

Validation Level: Level III

Laboratory: Shealy Environmental Services, Inc.

Sample Delivery Group (SDG): TJ09009

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
JP-M8-GWMW-330	TJ09009-009	Water	10/08/18
JP-M8-GWMW-330MS	TJ09009-009MS	Water	10/08/18
JP-M8-GWMW-330MSD	TJ09009-009MSD	Water	10/08/18

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Appendix B - 2017 Quality Assurance Project Plan Update, Long-Term Monitoring Plan (2017 QAPP; IEA/MWH JV, July 2017), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.1 (2017), and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Sulfate by Environmental Protection Agency (EPA) SW 846 Method 9056A

All sample results were subjected to Level III data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks with the following exceptions:

Blank ID	Analyte	Maximum Concentration	Associated Samples
ICB/CCB	Sulfate	0.23895 mg/L	All samples in SDG TJ09009

Data qualification by the laboratory blanks was based on the maximum contaminant concentration in the laboratory blanks in the analysis of each analyte. The sample concentrations were either not detected or were significantly greater (>5X blank contaminants) than the concentrations found in the associated laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. For JP-M8-GWMW-330MS/MSD, no data were qualified for Sulfate percent recoveries (%R) outside the QC limits since the parent sample results were greater than 4X the spike concentration. Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

The laboratory has indicated that there were no duplicate (DUP) analyses specified for the samples in this SDG, and therefore duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Sample Result Verification

Raw data were not reviewed for Level III validation.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Joliet Army Ammunition Plant
Sulfate - Data Qualification Summary - SDG TJ09009

No Sample Data Qualified in this SDG

Joliet Army Ammunition Plant
Sulfate - Laboratory Blank Data Qualification Summary - SDG TJ09009

No Sample Data Qualified in this SDG

Joliet Army Ammunition Plant
Sulfate - Field Blank Data Qualification Summary - SDG TJ09009

No Sample Data Qualified in this SDG

LDC #: 43824C6 **VALIDATION COMPLETENESS WORKSHEET** Date: 12-17-18

SDG #: TJ09009 Level III Page: 1 of 1

Laboratory: Shealy Environmental Services, Inc. Reviewer: MG

2nd Reviewer:

METHOD: (Analyte) Sulfate (EPA SW846 Method 9056A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	SW	
V	Field blanks	N	
VI.	Matrix Spike/Matrix Spike Duplicates	A	MS/MSD (SO4- 4x)
VII.	Duplicate sample analysis	N	
VIII.	Laboratory control samples	A	LCS
IX.	Field duplicates	N	
X.	Sample result verification	N	
XI.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

MG

	Client ID	Lab ID	Matrix	Date
1	JP-M~~0~~8-GWMW-330	TJ09009-009	Water	10/08/18
2	JP-M~~0~~8-GWMW-330MS	TJ09009-009MS	Water	10/08/18
3	JP-M~~0~~8-GWMW-330~~DUP~~ MSD	TJ09009-009~~DUP~~ MSD	Water	10/08/18
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15	PBW			

Notes:

LDC #: 43824C6

VALIDATION FINDINGS WORKSHEET
Blanks

Reviewer: MG
2nd Reviewer:

METHOD: Inorganics, Method 9056A

Conc. units: mg/L **Associated Samples:** all (>LOQ)

Analyte	Blank ID	Blank ID	Blank Action Limit											
	PB	ICB/CCB (mg/L)		No Qual.										
SO4		0.23895												

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
All contaminants within five times the method blank concentration were qualified as not detected, "U".

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Joliet Army Ammunition Plant

LDC Report Date: December 19, 2018

Parameters: Explosives

Validation Level: Level III

Laboratory: Shealy Environmental Services, Inc.

Sample Delivery Group (SDG): TJ09009

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
JP-L3-GWMW412	TJ09009-001	Water	10/06/18
JP-L3-GWMW630	TJ09009-002	Water	10/06/18
JP-L3-GWMW631	TJ09009-003	Water	10/06/18
JP-L3-GWMW633	TJ09009-004	Water	10/06/18
JP-L3-SW777	TJ09009-005	Water	10/06/18
JP-L3-GWMW997	TJ09009-006	Water	10/06/18
JP-M6-GWMW-212R	TJ09009-007	Water	10/08/18
JP-M6-GWMW-996	TJ09009-008	Water	10/08/18

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Appendix B - 2017 Quality Assurance Project Plan Update, Long-Term Monitoring Plan (2017 QAPP; IEA/MWH JV, July 2017), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.1 (2017), and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Explosives by Environmental Protection Agency (EPA) SW 846 Method 8330A

All sample results were subjected to Level III data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0% for all compounds.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 15.0% for all compounds.

III. Continuing Calibration

Continuing calibration was performed at required frequencies.

The percent differences (%D) were less than or equal to 15.0% for all compounds.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Surrogates

Surrogates were added to all samples as required by the method. Surrogate recoveries (%R) were not within QC limits for sample JP-M6-GWMW-212R. No data were qualified for samples analyzed at greater than or equal to 5X dilution.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

IX. Field Duplicates

Samples JP-L3-GWMW412 and JP-L3-GWMW997 and samples JP-M6-GWMW-212R and JP-M6-GWMW-996 were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Compound	Concentration (ug/L)		RPD (Limits)	Difference (Limits)	Flag	A or P
	JP-L3-GWMW412	JP-L3-GWMW997				
4-Amino-2,6-dinitrotoluene	1.0	1.2	-	0.2 (≤1.0)	-	-
2-Amino-4,6-dinitrotoluene	0.87	0.85	-	0.02 (≤1.0)	-	-
HMX	16	17	6 (≤25)	-	-	-
RDX	61	62	2 (≤25)	-	-	-

Compound	Concentration (ug/L)		RPD (Limits)	Difference (Limits)	Flag	A or P
	JP-M6-GWMW-212R	JP-M6-GWMW-996				
2-Amino-4,6-dinitrotoluene	16	22	-	6 (≤50)	-	-
2,4-Dinitrotoluene	920	1200	26 (≤25)	-	J (all detects)	A
2,6-Dinitrotoluene	250	330	28 (≤25)	-	J (all detects)	A
2-Nitrotoluene	4000	5100	24 (≤25)	-	-	-
3-Nitrotoluene	360	500	33 (≤25)	-	J (all detects)	A
4-Nitrotoluene	2500	3400	31 (≤25)	-	J (all detects)	A
2,4,6-Trinitrotoluene	130	180	-	50 (≤50)	-	-

X. Compound Quantitation

The sample results for detected compounds from the two columns were within 40% relative percent difference (RPD) with the following exceptions:

Sample	Compound	RPD	Flag	A or P
JP-M6-GWMW-212R	2-Amino-4,6-dinitrotoluene	41.01	J (all detects)	A

Raw data were not reviewed for Level III validation.

XI. Target Compound Identifications

Raw data were not reviewed for Level III validation.

XII. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to field duplicate RPD and RPDs between two columns, data were qualified as estimated in two samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Joliet Army Ammunition Plant
Explosives - Data Qualification Summary - SDG TJ09009

Sample	Compound	Flag	A or P	Reason
JP-M6-GWMW-212R JP-M6-GWMW-996	2,4-Dinitrotoluene 2,6-Dinitrotoluene 3-Nitrotoluene 4-Nitrotoluene	J (all detects) J (all detects) J (all detects) J (all detects)	P	Field duplicates (RPD)
JP-M6-GWMW-212R	2-Amino-4,6-dinitrotoluene	J (all detects)	A	Compound quantitation (RPD between two columns)

Joliet Army Ammunition Plant
Explosives - Laboratory Blank Data Qualification Summary - SDG TJ09009

No Sample Data Qualified in this SDG

Joliet Army Ammunition Plant
Explosives - Field Blank Data Qualification Summary - SDG TJ09009

No Sample Data Qualified in this SDG

LDC #: 43824C40 **VALIDATION COMPLETENESS WORKSHEET** Date: 12/18/18
SDG #: TJ09009 Level III Page: 1 of 1
Laboratory: Shealy Environmental Services, Inc. Reviewer: EJ
2nd Reviewer:

METHOD: HPLC Explosives (EPA SW 846 Method 8330A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A/A	
II.	Initial calibration/ICV	A/A	% RSD ≤ 20 ICV ≤ 15
III.	Continuing calibration	A	CCV ≤ 15
IV.	Laboratory Blanks	A	
V.	Field blanks	N	
VI.	Surrogate spikes	SW	
VII.	Matrix spike/Matrix spike duplicates	A	TJ06011-012 MS/MD
VIII.	Laboratory control samples	A	LCS
IX.	Field duplicates	SW	D = 1,6 D = 7,8
X.	Compound quantitation RL/LOQ/LODs	SW	
XI.	Target compound identification	N	
XII.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	JP-L3-GWMW412 D	TJ09009-001	Water	10/06/18
2	JP-L3-GWMW630	TJ09009-002	Water	10/06/18
3	JP-L3-GWMW631	TJ09009-003	Water	10/06/18
4	JP-L3-GWMW633	TJ09009-004	Water	10/06/18
5	JP-L3-SW777	TJ09009-005	Water	10/06/18
6	JP-L3-GWMW997 D	TJ09009-006	Water	10/06/18
7	JP-M6-GWMW-212R D_1	TJ09009-007	Water	10/08/18
8	JP-M6-GWMW-996 D_1	TJ09009-008	Water	10/08/18
9				
10				
11				
12				

Notes:

	85878						

VALIDATION FINDINGS WORKSHEET

METHOD: ____GC ____HPLC

8310	8330	8151	8141	8141(Con't)	8021B
A. Acenaphthene	A. HMX	A. 2,4-D	A. Dichlorvos	X. EPN	V. Benzene
B. Acenaphthylene	B. RDX	B. 2,4-DB	B. Mevinphos	Y. Azinphos-methyl	CC. Toluene
C. Anthracene	C. 1,3,5-Trinitrobenzene	C. 2,4,5-T	C. Demeton-O	Z. Coumaphos	EE. Ethyl Benzene
D. Benzo(a)anthracene	D. 1,3-Dinitrobenzene	D. 2,4,5-TP	D. Demeton-S	AA. Parathion	SSS. O-Xylene
E. Benzo(a)pyrene	E. Tetryl	E. Dinoseb	E. Ethoprop	BB. Trichloronate	RRR. MP-Xylene
F. Benzo(b)fluoranthene	F. Nitrobenzene	F. Dichlorprop	F. Naled	CC. Trichlorinate	GG. Total Xylene
G. Benzo(g,h,i)perylene	G. 2.4.6-Trinitrotoluene	G. Dicamba	G. Sulfotep	DD. Trifluralin	
H. Benzo(k)fluoranthene	H. 4-Amino-2,6-dinitrotoluene	H. Dalapon	H. Phorate	EE. Def	**8315A**
I. Chrysene	I. 2-Amino-4,6-dinitrotoluene	I. MCPP	I. Dimethoate	FF. Prowl	A. Formaldehyde
J. Dibenz(a,h)anthracene	J. 2,4-Dinitrotoluene	J. MCPA	J. Diazinon	GG. Ethion	B. Acetaldehyde
K. Fluoranthene	K. 2,6-Dinitrotoluene	K. Pentachlorophenol	K. Disulfoton	HH. Famphur	C. Benzaldehyde
L. Fluorene	L. 2-Nitrotoluene	L. 2,4,5-TP (silvex)	L. Parathion-methyl	II. Phosmet	D. Butyraldehyde
M. Indeno(1,2,3-cd)pyrene	M. 3-Nitrotoluene	M. Silvex	M. Ronnel	JJ. Tetrachlorvinphos	
N. Naphthalene	N. 4-Nitrotoluene	N.	N. Malathion	KK. Demeton (total)	
O. Phenanthrene	O. Nitroglycerin	O.	O. Chlorpyrifos		
P. Pyrene	P. Picric acid	P.	P. Fenthion		
Q.	Q. 2,4-Dinitrophenol	Q.	Q. Parathion-ethyl		
R.	R. 3,5-Dinitroaniline		R. Trichlornate		
S.	S. 2-Nitrophenol		S. Merphos		
	T. 4-Nitrophenol		T. Stirofos		
	U. Picramic acid		U. Tokuthion		
	V. PETN		V. Fensulfothion		
			W. Bolstar		

Notes:_____

_____

LDC #: 43824C4D

VALIDATION FINDINDS WORKSHEET
Surrogate Recovery

Reviewer: FT

2nd Reviewer: [signature]

METHOD: ~~GC~~ ✓ HPLC

Are surrogates required by the method? Yes____ or No____.

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Were surrogates spiked into all samples and blanks?

Y (N) N/A Did all surrogate recoveries (%R) meet the QC limits?

#	Sample ID	Detector/ Column	Surrogate Compound	%R (Limits)	Qualifications
	7			74 (83 -119)	no qual 7 5 x DL
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	

	Surrogate Compound		Surrogate Compound		Surrogate Compound		Surrogate Compound		
A	Chlorobenzene (CBZ)	G	Octacosane	M	Benzo(e)Pyrene	S	1-Chloro-3-Nitrobenzene	Y	Tetrachloro-m- xylene
B	4-Bromofluorobenzene (BFB)	H	Ortho-Terphenyl	N	Terphenyl-D14	T	3,4-Dinitrotoluene	Z	2-Bromonaphthalene
C`	a,a,a-Trifluorotoluene	I	Fluorobenzene (FBZ)	O	Decachlorobiphenyl (DCB)	U	Tripentyltin	AA	Chloro-octadecane
D	Bromochlorobenene	J	n-Triacontane	P	1-methylnaphthalene	V	Tri-n-propyltin	BB	2,4-Dichlorophenylacetic acid
E	1,4-Dichlorobutane	K	Hexacosane	Q	Dichlorophenyl Acetic Acid (DCAA)	W	Tributyl Phosphate	CC	2,5-Dibromotoluene
F	1,4-Difluorobenzene (DFB)	L	Bromobenzene	R	4-Nitrophenol	X	Triphenyl Phosphate		

LDC#: 43824C4D

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Page: 1 of 1
Reviewer: [illegible]
2nd Reviewer: [illegible]

METHOD: HPLC 8330A

Compound	Concentration (ug/L)		(≤~~20~~ 25) RPD	Difference	Limits	Qual
	1	6				
H	1.0	1.2		0.2	≤ 1.0	
I	0.87	0.85		0.02	≤ 1.0	
A	16	17	6			
B	61	62	2			

Compound	Concentration (ug/L)		(≤~~20~~ 25) RPD	Difference	Limits	Qual
	7	8				
I	16	22		6	≤ 50	
J	920	1200	26			Jdet/A
K	250	330	28			Jdet/A
L	4000	5100	24			~~Jdet/A~~
M	360	500	33			Jdet/A
N	2500	3400	31			Jdet/A
G	130	180		50	≤ 50	

LDC #: 43824C4U

VALIDATION FINDINGS WORKSHEET
Compound Quantitation and Reported CRQLs

Reviewer: FT
2nd Reviewer:

METHOD: ___ GC ✓ HPLC

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Level IV/D Only

Y N N/A Were CRQLs adjusted for sample dilutions, dry weight factors, etc.?

Y N N/A Did the reported results for detected target compounds agree within 10.0% of the recalculated results?

#	Associated Samples	Compound Name	% RPD Bet 2 col ≤40 Findings	Qualifications
	7	I	41.01	but /A

Comments: See sample calculation verification worksheet for recalculations

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Joliet Army Ammunition Plant

LDC Report Date: December 19, 2018

Parameters: Volatiles

Validation Level: Level III

Laboratory: Shealy Environmental Services, Inc.

Sample Delivery Group (SDG): TJ10017

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
JP-M13-GWMW995	TJ10017-001	Water	10/09/18
JP-M13-GWMW362	TJ10017-002	Water	10/09/18
JP-M13-GWMW994	TJ10017-003	Water	10/09/18
JP-M13-GWMW126R	TJ10017-004	Water	10/09/18
JP-M13-GWMW808	TJ10017-005	Water	10/09/18
JP-M13-GWMW809	TJ10017-006	Water	10/09/18
JP-M13-GWMW806	TJ10017-007	Water	10/09/18
JP-M13-GWMW807	TJ10017-008	Water	10/09/18
JP-M13-GWMW811	TJ10017-009	Water	10/09/18
TRIP BLANK	TJ10017-010	Water	10/09/18

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Appendix B - 2017 Quality Assurance Project Plan Update, Long-Term Monitoring Plan (2017 QAPP; IEA/MWH JV, July 2017), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.1 (2017), and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260B

All sample results were subjected to Level III data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met with the following exceptions:

Sample	Compound	Total Days From Sample Collection Until Analysis	Required Holding Time (in Days) From Sample Collection Until Analysis	Flag	A or P
JP-M13-GWMW811	All compounds	11	7	UJ (all non-detects)	A

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals. All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 15.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds.

The percent differences (%D) of the ending continuing calibration verifications (CCVs) were less than or equal to 50.0% for all compounds.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample TRIP BLANK was identified as a trip blank. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

X. Field Duplicates

Samples JP-M13-GWMW995 and JP-M13-GWMW362 and samples JP-M13-GWMW994 and JP-M13-GWMW126R were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Compound	Concentration (ug/L)		RPD (Limits)	Difference (Limits)	Flag	A or P
	JP-M13-GWMW995	JP-M13-GWMW362				
1,1-Dichloroethane	0.78	0.70	-	0.08 (≤1.0)	-	-
cis-1,2-Dichloroethene	0.40	0.80U	-	0.4 (≤1.0)	-	-

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

Raw data were not reviewed for Level III validation.

XIII. Target Compound Identifications

Raw data were not reviewed for Level III validation.

XIV. System Performance

Raw data were not reviewed for Level III validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

Due to technical holding time, data were qualified as estimated in one sample.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Joliet Army Ammunition Plant
Volatiles - Data Qualification Summary - SDG TJ10017

Sample	Compound	Flag	A or P	Reason
JP-M13-GWMW811	All compounds	UJ (all non-detects)	A	Technical holding times

Joliet Army Ammunition Plant
Volatiles - Laboratory Blank Data Qualification Summary - SDG TJ10017

No Sample Data Qualified in this SDG

Joliet Army Ammunition Plant
Volatiles - Field Blank Data Qualification Summary - SDG TJ10017

No Sample Data Qualified in this SDG

LDC #: 43824D1 **VALIDATION COMPLETENESS WORKSHEET** Date: 12/18/18

SDG #: TJ10017 Level III Page: 1 of 1

Laboratory: Shealy Environmental Services, Inc. Reviewer: [illegible]

2nd Reviewer: [illegible]

METHOD: GC/MS Volatiles (EPA SW846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	SW/A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A/A	% RSD ≤ 15, r² ICV ≤ 20
IV.	Continuing calibration /closing CCV	A	CCV ≤ 20/50
V.	Laboratory Blanks	A	
VI.	Field blanks	ND	TB = 10
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	CS
IX.	Laboratory control samples	A	LCS
X.	Field duplicates	SW	D = 1,2 3,4
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	N	
XIII.	Target compound identification	N	
XIV.	System performance	N	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	JP-M13-GWMW995 D	TJ10017-001	Water	10/09/18
2	JP-M13-GWMW362 D	TJ10017-002	Water	10/09/18
3	JP-M13-GWMW994 D1	TJ10017-003	Water	10/09/18
4	JP-M13-GWMW126R D1	TJ10017-004	Water	10/09/18
5	JP-M13-GWMW808	TJ10017-005	Water	10/09/18
6	JP-M13-GWMW809	TJ10017-006	Water	10/09/18
7	JP-M13-GWMW806	TJ10017-007	Water	10/09/18
8	JP-M13-GWMW807	TJ10017-008	Water	10/09/18
9	JP-M13-GWMW811	TJ10017-009	Water	10/09/18
10	TRIP BLANK	TJ10017-010	Water	10/09/18
11				
12	VBLKVH			
13				

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 43824D1

VALIDATION FINDINGS WORKSHEET
Technical Holding Times

Reviewer: FT
2nd Reviewer:

All circled dates have exceeded the technical holding times.
Y N N/A Were all cooler temperatures within validation criteria?
Y (N) N/A Were air bubbles > 1/4 inch or was headspace present in the vials?

METHOD : GC/MS VOA (EPA SW 846 Method 8260B)

Sample ID	Matrix	Preserved	Sampling Date	Extraction date	Analysis date	Total # of Days	Qualifier
9	W	pH=7	10/9/18		10/20/18	11	J/UJ/A (ND)

TECHNICAL HOLDING TIME CRITERIA

Water unpreserved:	Aromatic within 7 days, non-aromatic within 14 days of sample collection.
Water preserved:	Within 14 days of sample collection.
Soil:	Within 14 days of sample collection.

LDC#: 43824D1

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Page: 1 of 1
Reviewer: F
2nd Reviewer:

METHOD: GCMS VOA 8260B

Compound	Concentration (ug/L)		(≤20) RPD	Difference	Limits	Qual
	1	2				
I	0.78	0.70		0.08	≤ 1.0	
QQQ	0.40	0.80U		0.4	≤ 1.0	

V:\FIELD DUPLICATES\Field Duplicates\FD_Organics\2018\43824D1.wpd

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Joliet Army Ammunition Plant

LDC Report Date: December 19, 2018

Parameters: Semivolatiles

Validation Level: Level III

Laboratory: Shealy Environmental Services, Inc.

Sample Delivery Group (SDG): TJ10017

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
JP-M13-GWMW995	TJ10017-001	Water	10/09/18
JP-M13-GWMW362	TJ10017-002	Water	10/09/18
JP-M13-GWMW994	TJ10017-003	Water	10/09/18
JP-M13-GWMW126R	TJ10017-004	Water	10/09/18
JP-M13-GWMW808	TJ10017-005	Water	10/09/18
JP-M13-GWMW809	TJ10017-006	Water	10/09/18
JP-M13-GWMW806	TJ10017-007	Water	10/09/18
JP-M13-GWMW807	TJ10017-008	Water	10/09/18
JP-M13-GWMW811	TJ10017-009	Water	10/09/18
JP-M13-GWMW808MS	TJ10017-005MS	Water	10/09/18
JP-M13-GWMW808MSD	TJ10017-005MSD	Water	10/09/18

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Appendix B - 2017 Quality Assurance Project Plan Update, Long-Term Monitoring Plan (2017 QAPP; IEA/MWH JV, July 2017), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.1 (2017), and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) by Environmental Protection Agency (EPA) SW 846 Method 8270D

All sample results were subjected to Level III data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals. All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 15.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
10/22/18 (18:33)	2-Methylphenol	20.1	All samples in SDG TJ10017	UJ (all non-detects)	A
10/22/18 (22:33)	Benzidine	20.3	All samples in SDG TJ10017	UJ (all non-detects)	A

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
10/23/18 (09:10)	Aniline 2,4-Dinitrophenol	43.7 22.1	JP-M13-GWMW995 JP-M13-GWMW362 JP-M13-GWMW126R JP-M13-GWMW808 JP-M13-GWMW809 JP-M13-GWMW806 JP-M13-GWMW807 JP-M13-GWMW811	UJ (all non-detects) UJ (all non-detects)	A
10/23/18 (09:34)	Benzidine	31.3	JP-M13-GWMW995 JP-M13-GWMW362 JP-M13-GWMW126R JP-M13-GWMW808 JP-M13-GWMW809 JP-M13-GWMW806 JP-M13-GWMW807 JP-M13-GWMW811	UJ (all non-detects)	A
10/24/18 (09:06)	Aniline 4,6-Dinitro-2-methylphenol	44.3 25.4	JP-M13-GWMW994	UJ (all non-detects) UJ (all non-detects)	A
10/24/18 (09:30)	Benzidine	21.4	JP-M13-GWMW994	UJ (all non-detects)	A

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Compound	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
JP-M13-GWMW808MS/MSD (JP-M13-GWMW808)	Aniline	-	24 (30-130)	UJ (all non-detects)	A
	Benzyl alcohol	-	42 (31-112)	UJ (all non-detects)	
	Bis(2-chloro-1-methylethyl)ether	-	31 (37-130)	UJ (all non-detects)	
	Bis(2-chloroethoxy)methane	-	40 (48-120)	UJ (all non-detects)	
	2-Chlorophenol	-	27 (38-117)	UJ (all non-detects)	
	1,2-Dichlorobenzene	-	20 (32-111)	UJ (all non-detects)	
	1,3-Dichlorobenzene	-	18 (28-110)	UJ (all non-detects)	
	1,4-Dichlorobenzene	-	19 (29-112)	UJ (all non-detects)	
JP-M13-GWMW808MS/MSD (JP-M13-GWMW808)	Benzidine	0 (10-54)	0 (10-54)	R (all non-detects)	A
	3,3'-Dichlorobenzidine	0 (27-129)	9.3 (27-129)	R (all non-detects)	

Relative percent differences (RPD) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Compound	RPD (Limits)	Flag	A or P
JP-M13-GWMW808MS/MSD (JP-M13-GWMW808)	Acenaphthene	21 (≤20)	NA	-
	Acenaphthylene	24 (≤20)		
	Aniline	72 (≤20)		
	Benzyl alcohol	30 (≤20)		
	Bis(2-chloro-1-methylethyl)ether	63 (≤20)		
	4-Chloroaniline	37 (≤20)		
	Bis(2-chloroethoxy)methane	42 (≤20)		
	2-Chlorophenol	62 (≤20)		
	1,2-Dichlorobenzene	93 (≤20)		
	1,3-Dichlorobenzene	99 (≤20)		
	1,4-Dichlorobenzene	94 (≤20)		
	3,3'-Dichlorobenzidine	200 (≤20)		
	2,4-Dichlorophenol	24 (≤20)		

IX. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID	Compound	%R (Limits)	Associated Samples	Flag	A or P
87016-LCS	2,4,5-Trichlorophenol	50 (53-123)	All samples in SDG TJ10017	UJ (all non-detects)	P
	Phenol	44 (79-117)		UJ (all non-detects)	

X. Field Duplicates

Samples JP-M13-GWMW995 and JP-M13-GWMW362 and samples JP-M13-GWMW994 and JP-M13-GWMW126R were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Compound	Concentration (ug/L)		RPD (Limits)	Difference (Limits)	Flag	A or P
	JP-M13-GWMW995	JP-M13-GWMW362				
Benzoic acid	1.8	1.3	-	0.5 (≤40)	-	-
2,4-Dinitrotoluene	3.6	3.2	-	0.4 (≤1.6)	-	-
Bis(2-ethylhexyl)phthalate	0.55	0.80U	-	0.25 (≤4.0)	-	-

Compound	Concentration (ug/L)		RPD (Limits)	Difference (Limits)	Flag	A or P
	JP-M13-GWMW994	JP-M13-GWMW126R				
Benzoic acid	1.3	1.3	-	0 (≤40)	-	-
Bis(2-ethylhexyl)phthalate	0.80U	0.67	-	0.13 (≤4.0)	-	-

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

Raw data were not reviewed for Level III validation.

XIII. Target Compound Identifications

Raw data were not reviewed for Level III validation.

XIV. System Performance

Raw data were not reviewed for Level III validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method.

Due to MS/MSD %R, data were rejected in one sample.

Due to ICV %D, continuing calibration %D, MS/MSD %R, and LCS %R, data were qualified as estimated in nine samples.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be rejected (R) are unusable for all purposes. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Joliet Army Ammunition Plant
Semivolatiles - Data Qualification Summary - SDG TJ10017

Sample	Compound	Flag	A or P	Reason
JP-M13-GWMW995 JP-M13-GWMW362 JP-M13-GWMW994 JP-M13-GWMW126R JP-M13-GWMW809 JP-M13-GWMW806 JP-M13-GWMW807 JP-M13-GWMW811	2-Methylphenol Benzidine	UJ (all non-detects)	A	Initial calibration verification (%D)
JP-M13-GWMW808	2-Methylphenol	UJ (all non-detects)	A	Initial calibration verification (%D)
JP-M13-GWMW995 JP-M13-GWMW362 JP-M13-GWMW126R JP-M13-GWMW809 JP-M13-GWMW806 JP-M13-GWMW807 JP-M13-GWMW811	Aniline 2,4-Dinitrophenol Benzidine	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)
JP-M13-GWMW808	Aniline 2,4-Dinitrophenol	UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)
JP-M13-GWMW994	Aniline 4,6-Dinitro-2-methylphenol Benzidine	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D)
JP-M13-GWMW808	Aniline Benzyl alcohol Bis(2-chloro-1-methylethyl)ether Bis(2-chloroethoxy)methane 2-Chlorophenol 1,2-Dichlorobenzene 1,3-Dichlorobenzene 1,4-Dichlorobenzene	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)
JP-M13-GWMW808	Benzidine 3,3'-Dichlorobenzidine	R (all non-detects) R (all non-detects)	A	Matrix spike/Matrix spike duplicate (%R)
JP-M13-GWMW995 JP-M13-GWMW362 JP-M13-GWMW994 JP-M13-GWMW126R JP-M13-GWMW808 JP-M13-GWMW809 JP-M13-GWMW806 JP-M13-GWMW807 JP-M13-GWMW811	2,4,5-Trichlorophenol Phenol	UJ (all non-detects) UJ (all non-detects)	P	Laboratory control samples (%R)

Joliet Army Ammunition Plant
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG TJ10017

No Sample Data Qualified in this SDG

Joliet Army Ammunition Plant
Semivolatiles - Field Blank Data Qualification Summary - SDG TJ10017

No Sample Data Qualified in this SDG

LDC #: 43824D2a

VALIDATION COMPLETENESS WORKSHEET

Level III

Date: 12/18/18

SDG #: TJ10017

Page: 1 of 1

Laboratory: Shealy Environmental Services, Inc.

Reviewer:

2nd Reviewer:

METHOD: GC/MS Semivolatiles (EPA SW846 Method 8270D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A/A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A/SW	% RSD ≤ 15, r² ICV ≤ 20
IV.	Continuing calibration / closing CCV	SW	CCV ≤ 20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	SW	
IX.	Laboratory control samples	SW	LCS
X.	Field duplicates	SW	D = 1,2 3,4
XI.	Internal standards	A	
XII.	Compound quantitation RL/LOQ/LODs	N	
XIII.	Target compound identification	N	
XIV.	System performance	N	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	JP-M13-GWMW995 D	TJ10017-001	Water	10/09/18
2	JP-M13-GWMW362 D	TJ10017-002	Water	10/09/18
3	JP-M13-GWMW994 D1	TJ10017-003	Water	10/09/18
4	JP-M13-GWMW126R D1	TJ10017-004	Water	10/09/18
5	JP-M13-GWMW808	TJ10017-005	Water	10/09/18
6	JP-M13-GWMW809	TJ10017-006	Water	10/09/18
7	JP-M13-GWMW806	TJ10017-007	Water	10/09/18
8	JP-M13-GWMW807	TJ10017-008	Water	10/09/18
9	JP-M13-GWMW811	TJ10017-009	Water	10/09/18
10	JP-M13-GWMW808MS	TJ10017-005MS	Water	10/09/18
11	JP-M13-GWMW808MSD	TJ10017-005MSD	Water	10/09/18
12				
13	~~8270~~ 8614			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	CC. Dimethylphthalate	EEE. Bis(2-ethylhexyl)phthalate	GGGG. C30-Hopane	I1. Methyl methanesulfonate
B. Bis (2-chloroethyl) ether	DD. Acenaphthylene	FFF. Di-n-octylphthalate	HHHH. 1-Methylphenanthrene	J1. Ethyl methanesulfonate
C. 2-Chlorophenol	EE. 2,6-Dinitrotoluene	GGG. Benzo(b)fluoranthene	IIII. 1,4-Dioxane	K1. o,o',o''-Triethylphosphorothioate
D. 1,3-Dichlorobenzene	FF. 3-Nitroaniline	HHH. Benzo(k)fluoranthene	JJJJ. Acetophenone	L1. n-Phenylene diamine
E. 1,4-Dichlorobenzene	GG. Acenaphthene	III. Benzo(a)pyrene	KKKK. Atrazine	M1. 1,4-Naphthoquinone
F. 1,2-Dichlorobenzene	HH. 2,4-Dinitrophenol	JJJ. Indeno(1,2,3-cd)pyrene	LLLL. Benzaldehyde	N1. N-Nitro-o-toluidine
G. 2-Methylphenol	II. 4-Nitrophenol	KKK. Dibenz(a,h)anthracene	MMMM. Caprolactam	O1. 1,3,5-Trinitrobenzene
H. 2,2'-Oxybis(1-chloropropane)	JJ. Dibenzofuran	LLL. Benzo(g,h,i)perylene	NNNN. 2,6-Dichlorophenol	P1. Pentachlorobenzene
I. 4-Methylphenol	KK. 2,4-Dinitrotoluene	MMM. Bis(2-Chloroisopropyl)ether	OOOO. 1,2-Diphenylhydrazine	Q1. 4-Aminobiphenyl
J. N-Nitroso-di-n-propylamine	LL. Diethylphthalate	NNN. Aniline	PPPP. 3-Methylphenol	R1. 2-Naphthylamine
K. Hexachloroethane	MM. 4-Chlorophenyl-phenyl ether	OOO. N-Nitrosodimethylamine	QQQQ. 3&4-Methylphenol	S1. Triphenylene
L. Nitrobenzene	NN. Fluorene	PPP. Benzoic Acid	RRRR. 4-Dimethyldibenzothiophene (4MDT)	T1. Octachlorostyrene
M. Isophorone	OO. 4-Nitroaniline	QQQ. Benzyl alcohol	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	U1. Famphur
N. 2-Nitrophenol	PP. 4,6-Dinitro-2-methylphenol	RRR. Pyridine	TTTT. 1-Methyldibenzothiophene (1MDT)	V1. 1,4-phenylenediamine
O. 2,4-Dimethylphenol	QQ. N-Nitrosodiphenylamine	SSS. Benzidine	UUUU.. 2,3,4,6-Tetrachlorophenol	W1. Methapyrilene
P. Bis(2-chloroethoxy)methane	RR. 4-Bromophenyl-phenylether	TTT. 1-Methylnaphthalene	VVVV. 1,2,4,5-Tetrachlorobenzene	X1. Pentachloroethane
Q. 2,4-Dichlorophenol	SS. Hexachlorobenzene	UUU.Benzo(b)thiophene	WWWW.. 2-Picoline	Y1. 3,3'-Dimethylbenzidine
R. 1,2,4-Trichlorobenzene	TT. Pentachlorophenol	VVV.Benzonaphthothiophene	XXXX. 3-Methylcholanthrene	Z1. o-Toluidine
S. Naphthalene	UU. Phenanthrene	WWW.Benzo(e)pyrene	YYYY. a,a-Dimethylphenethylamine	A2. 1-Naphthylamine
T. 4-Chloroaniline	VV. Anthracene	XXX. 2,6-Dimethylnaphthalene	ZZZZ. Hexachloropropene	B2. 4-Aminobiphenyl
U. Hexachlorobutadiene	WW. Carbazole	YYY. 2,3,5-Trimethylnaphthalene	A1. N-Nitrosodiethylamine	C2. 4-Nitroquinoline-1-oxide
V. 4-Chloro-3-methylphenol	XX. Di-n-butylphthalate	ZZZ. Perylene	B1. N-Nitrosodi-n-butylamine	D2. Hexachloropene
W. 2-Methylnaphthalene	YY. Fluoranthene	AAAA. Dibenzothiophene	C1. N-Nitrosomethylethylamine	E2. Bis (2-chloro-1-methylethyl) ether
X. Hexachlorocyclopentadiene	ZZ. Pyrene	BBBB. Benzo(a)fluoranthene	D1. N-Nitrosomorpholine	F2. Bifenthrin
Y. 2,4,6-Trichlorophenol	AAA. Butylbenzylphthalate	CCCC. Benzo(b)fluorene	E1. N-Nitrosopyrrolidine	G2.Cyfluthrin
Z. 2,4,5-Trichlorophenol	BBB. 3,3'-Dichlorobenzidine	DDDD. cis/trans-Decalin	F1. Phenacetin	H2.Cypermethrin
AA. 2-Chloronaphthalene	CCC. Benzo(a)anthracene	EEEE. Biphenyl	G1. 2-Acetylaminofluorene	I2.Permethrin (cis/trans)
BB. 2-Nitroaniline	DDD. Chrysene	FFFF. Retene	H1. Pronamide	J2. 5-Nitro-o-toluidine

LDC #: 43824D2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Verification

Reviewer: FT
2nd Reviewer:

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".
Y N N/A Was an initial calibration verification standard analyzed after each ICAL for each instrument?
Y N N/A Were all %D within the validation criteria of ≤~~30~~%D ? 20%

#	Date	Standard ID	Compound	Finding %D (Limit: ≤~~30.0%~~) 20%	Associated Samples	Qualifications
	10/22/18 1833	ICV-10	G	20.1	All	J/UJ/A ND
	10/22/18 2233	ICV-10	SSS	20.3	All	J/UJ/A ND

LDC #: 43824D2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
	10/23/18 0910	CCV-10	NNN	43.7		1, 2, 4 → 11,	J/UJ/A (ND)
			HH	22.1	F1	~~87016~~ - MB 86142	
	10/23/18 0934	CCV-10	SSS	31.3		↓	
	10/24/18 0906	CCV-10	NNN	44.3		3	J/UJ/A (ND)
			PP	25.4			
	10/24/18 0930	CCV-10	SSS	21.4		3	J/UJ/A (ND)

LDC #: 43824 D2a

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: FT
2nd Reviewer:

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.

Y N N/A Was a MS/MSD analyzed every 20 samples of each matrix?

Y N N/A Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	MS/MSD ID	Compound	MS %R (Limits)	MSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	10 of 11	per following pages	( )	( )	( )	5	
			( )	( )	( )		
			( )	( )			
			( )	( )	( )	All %R =	J/UJ/A all ND
			( )	( )	( )	except %R for	SSS + BBB = J/R/A
			( )	( )	( )		(ND)
			( )	( )	( )		
			( )	( )	( )	All % RPD	= J/UJ/A all ND
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
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			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		

FORM 3
MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

10 & 11

Lab Name: Shealy Environmental Services, Inc. Lot No.: TJ10017

Project No.: _____

Analytical Method: SVOA Matrix: Water

Client Sample ID (Matrix Spike/Matrix Spike Duplicate): JP-M13-GWMW808

Instrument ID: Agilent_MSD10

Concentration Units (ug/L, mg/L, ug/kg): ug/L

ANALYTE	SPIKE ADDED	SAMPLE CONCENTRATION	MS CONCENTRATION	MS %REC #	QC LIMITS REC.
Acenaphthene	8.0		5.7	71	47-122
Acenaphthylene	8.0		5.2	65	41-130
Aniline	8.0		4.0	50	30-130
Anthracene	8.0		6.0	75	57-123
Benzidine	40	SSS		0.00 *	10-54
Benzo(a)anthracene	8.0		6.6	83	58-125
Benzo(a)pyrene	8.0		6.0	75	54-128
Benzo(b)fluoranthene	8.0		7.0	87	53-131
Benzo(g,h,i)perylene	8.0		5.6	70	50-134
Benzo(k)fluoranthene	8.0		6.7	84	57-129
Benzyl alcohol	8.0		4.6	57	31-112
4-Bromophenyl phenyl ether	8.0		6.1	76	55-124
Butyl benzyl phthalate	8.0		7.6	94	53-134
Carbazole	8.0		6.7	84	60-122
bis (2-Chloro-1-	8.0		4.8	60	37-130
4-Chloro-3-methyl phenol	8.0		5.8	72	52-119
4-Chloroaniline	8.0		5.5	68	33-117
bis(2-Chloroethoxy)methane	8.0		4.9	62	48-120
2-Chlorophenol	8.0		4.1	52	38-117
4-Chlorophenyl phenyl ether	8.0		5.7	71	53-121
Chrysene	8.0		6.7	84	59-123
Dibenzo(a,h)anthracene	8.0		5.7	72	51-134
Dibenzofuran	8.0		5.4	67	53-118
1,2-Dichlorobenzene	8.0		4.4	55	32-111
1,3-Dichlorobenzene	8.0		4.2	52	28-110
1,4-Dichlorobenzene	8.0		4.2	53	29-112
3,3'-Dichlorobenzidine	8.0	BBB		0.00 *	27-129
2,4-Dichlorophenol	8.0		4.9	61	47-121
Diethylphthalate	8.0		6.9	86	56-125
Dimethyl phthalate	8.0		6.5	81	45-127
2,4-Dimethylphenol	8.0		5.9	74	31-124
Di-n-butyl phthalate	8.0		7.3	91	59-127
4,6-Dinitro-2-methylphenol	8.0		8.0	100	44-137
2,4-Dinitrophenol	16		18	111	23-143
2,4-Dinitrotoluene	8.0		7.1	88	57-128
2,6-Dinitrotoluene	8.0		6.6	83	57-124
Di-n-octylphthalate	8.0		5.9	74	51-140

* Values outside of QC Limits

FORM 3
MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

10 & 11

Lab Name: Shealy Environmental Services, Inc. Lot No.: TJ10017

Project No.: _____

Analytical Method: SVOA Matrix: Water

Client Sample ID (Matrix Spike/Matrix Spike Duplicate): JP-M13-GWMW808

Instrument ID: Agilent__MSD10

Concentration Units (ug/L, mg/L, ug/kg): ug/L

ANALYTE	SPIKE ADDED	SAMPLE CONCENTRATION	MS CONCENTRATION	MS %REC #	QC LIMITS REC.
1,2-Diphenylhydrazine(as	8.0		5.7	71	49-122
bis(2-Ethylhexyl)phthalate	8.0		7.5	94	55-135
Fluoranthene	8.0		6.7	83	57-128
Fluorene	8.0		5.9	74	52-124
Hexachlorobenzene	8.0		5.8	72	53-125
Hexachlorobutadiene	8.0		4.5	56	22-124
Hexachlorocyclopentadiene	40		15	38	16-96
Hexachloroethane	8.0		4.1	52	21-115
Indeno(1,2,3-c,d)pyrene	8.0		5.8	73	52-134
Isophorone	8.0		5.3	66	42-124
2-Methylphenol	8.0		5.8	73	30-117
3+4-Methylphenol	8.0		5.4	68	29-110
Naphthalene	8.0		4.9	61	40-121
2-Nitroaniline	8.0		7.0	87	55-127
3-Nitroaniline	8.0		6.0	75	41-128
4-Nitroaniline	8.0		7.1	89	60-135
Nitrobenzene	8.0		5.6	70	45-121
2-Nitrophenol	8.0		6.2	78	47-123
4-Nitrophenol	16		16	98	53-130
N-Nitrosodimethylamine	8.0		4.6	57	41-123
N-Nitrosodi-n-propylamine	8.0		6.2	77	49-119
N-Nitrosodiphenylamine	8.0		6.4	80	51-123
Pentachlorophenol	16		16	98	35-138
Phenanthrene	8.0		6.1	76	59-120
Phenol	8.0		4.0	50	49-117
Pyrene	8.0		6.6	83	57-126
Pyridine	8.0		4.8	60	19-112
1,2,4-Trichlorobenzene	8.0		4.6	58	29-116
2,4,5-Trichlorophenol	8.0		5.8	72	53-123
2,4,6-Trichlorophenol	8.0		5.8	72	50-125

* Values outside of QC Limits

FORM 3
MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: Shealy Environmental Services, Inc. Lot No.: TJ10017

Project No.: _____

Analytical Method: SVOA Matrix: Water

Client Sample ID (Matrix Spike/Matrix Spike Duplicate): JP-M13-GWMW808

Instrument ID: Agilent_MSD10

Concentration Units (ug/L, mg/L, ug/kg): ug/L

10 & 11

ANALYTE	SPIKE ADDED	MSD CONCENTRATION	MSD %R	#	RPD	#	QC LIMITS RPD	QC LIMITS %R
Acenaphthene GG	8.0	4.6	57		21	*	0-20	47-122
Acenaphthylene DD	8.0	4.1	51		24	*	0-20	41-130
Aniline NNN	8.0	1.9	24	*	72	*	0-40	30-130
Anthracene	8.0	5.2	65		14		0-20	57-123
Benzidine SSS	40		0.00	*	0.00		0-20	10-54
Benzo(a)anthracene	8.0	5.8	73		13		0-20	58-125
Benzo(a)pyrene	8.0	5.1	64		15		0-20	54-128
Benzo(b)fluoranthene	8.0	6.0	74		15		0-20	53-131
Benzo(g,h,i)perylene	8.0	5.0	62		13		0-20	50-134
Benzo(k)fluoranthene	8.0	6.0	75		11		0-20	57-129
Benzyl alcohol QQQ	8.0	3.4	42		30	*	0-20	31-112
4-Bromophenyl phenyl ether	8.0	5.1	64		17		0-20	55-124
Butyl benzyl phthalate	8.0	6.8	85		11		0-20	53-134
Carbazole	8.0	5.9	74		13		0-20	60-122
bis (2-Chloro-1- E2	8.0	2.5	31	*	63	*	0-20	37-130
4-Chloro-3-methyl phenol	8.0	5.1	63		13		0-20	52-119
4-Chloroaniline T	8.0	3.7	47		37	*	0-20	33-117
bis(2-Chloroethoxy)methane P	8.0	3.2	40	*	42	*	0-20	48-120
2-Chlorophenol C	8.0	2.2	27	*	62	*	0-20	38-117
4-Chlorophenyl phenyl ether	8.0	4.8	60		17		0-20	53-121
Chrysene	8.0	5.9	73		14		0-20	59-123
Dibenzo(a,h)anthracene	8.0	4.9	62		15		0-20	51-134
Dibenzofuran	8.0	4.5	56		18		0-20	53-118
1,2-Dichlorobenzene F	8.0	1.6	20	*	93	*	0-20	32-111
1,3-Dichlorobenzene D	8.0	1.4	18	*	99	*	0-20	28-110
1,4-Dichlorobenzene E	8.0	1.5	19	*	94	*	0-20	29-112
3,3'-Dichlorobenzidine BBB	8.0	0.74	9.3	*	200	*	0-20	27-129
2,4-Dichlorophenol Q	8.0	3.8	48		24	*	0-20	47-121
Diethylphthalate	8.0	6.0	76		14		0-20	56-125
Dimethyl phthalate	8.0	5.5	68		17		0-20	45-127
2,4-Dimethylphenol	8.0	4.8	60		20		0-20	31-124
Di-n-butyl phthalate	8.0	6.6	82		11		0-20	59-127
4,6-Dinitro-2-methylphenol	8.0	7.0	87		14		0-20	44-137
2,4-Dinitrophenol	16	16	97		13		0-20	23-143

* Values outside of QC Limits

FORM 3
MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: Shealy Environmental Services, Inc. Lot No.: TJ10017

Project No.: _____

Analytical Method: SVOA Matrix: Water

Client Sample ID (Matrix Spike/Matrix Spike Duplicate): JP-M13-GWMW808

Instrument ID: Agilent_MSD10

Concentration Units (ug/L, mg/L, ug/kg): ug/L

10 & 11

ANALYTE	SPIKE ADDED	MSD CONCENTRATION	MSD %R	#	RPD	#	QC LIMITS RPD	QC LIMITS %R
2,4-Dinitrotoluene	8.0	6.3	78		12		0-20	57-128
2,6-Dinitrotoluene	8.0	5.8	72		14		0-20	57-124
Di-n-octylphthalate	8.0	5.0	63		16		0-20	51-140
1,2-Diphenylhydrazine(as	8.0	5.0	62		14		0-20	49-122
bis(2-Ethylhexyl)phthalate EEE	8.0	6.1	77		21	*	0-20	55-135
Fluoranthene	8.0	5.9	74		12		0-20	57-128
Fluorene	8.0	5.0	62		17		0-20	52-124
Hexachlorobenzene	8.0	4.9	62		16		0-20	53-125
Hexachlorobutadiene U	8.0	2.1	26		73	*	0-20	22-124
Hexachlorocyclopentadiene X	40	9.3	23		49	*	0-20	16-96
Hexachloroethane K	8.0	1.4	18	*	96	*	0-20	21-115
Indeno(1,2,3-c,d)pyrene	8.0	5.0	62		16		0-20	52-134
Isophorone M	8.0	3.9	48		31	*	0-20	42-124
2-Methylphenol G	8.0	3.8	48		41	*	0-20	30-117
3+4-Methylphenol QQQQ	8.0	4.3	53		24	*	0-20	29-110
Naphthalene S	8.0	2.8	35	*	55	*	0-20	40-121
2-Nitroaniline	8.0	5.9	73		17		0-20	55-127
3-Nitroaniline	8.0	5.4	67		11		0-20	41-128
4-Nitroaniline	8.0	6.5	81		9.4		0-20	60-135
Nitrobenzene L	8.0	3.1	38	*	58	*	0-20	45-121
2-Nitrophenol N	8.0	3.7	47		50	*	0-20	47-123
4-Nitrophenol	16	14	85		15		0-20	53-130
N-Nitrosodimethylamine ~~OOO~~	8.0	1.7	21	*	92	*	0-20	41-123
N-Nitrosodi-n-propylamine J	8.0	4.2	52		39	*	0-20	49-119
N-Nitrosodiphenylamine	8.0	5.5	69		15		0-20	51-123
Pentachlorophenol	16	14	85		15		0-20	35-138
Phenanthrene	8.0	5.4	67		12		0-20	59-120
Phenol A	8.0	2.6	32	*	42	*	0-20	49-117
Pyrene	8.0	5.9	74		12		0-20	57-126
Pyridine RRR	8.0	2.1	26		78	*	0-20	19-112
1,2,4-Trichlorobenzene R	8.0	2.4	30		64	*	0-20	29-116
2,4,5-Trichlorophenol	8.0	4.9	61		17		0-20	53-123
2,4,6-Trichlorophenol	8.0	4.8	61		18		0-20	50-125

* Values outside of QC Limits

LDC #: 43824D2a

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270D)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a LCS required?

Y N N/A Were the LCS/LCSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	87016-LCS	Z	50 (53-123)	( )	( )	All	J/UJ/P (ND)
		A	44 (49-117)	( )	( )	↓	↓
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
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LDC#: 43824D2a

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Page: 1 of 1
Reviewer: F2
2nd Reviewer:

METHOD: GCMS SVOA 8270D

Compound	Concentration (ug/L)		(≤20) RPD	Difference	Limits	Qual
	1	2				
PPP	1.8	1.3		0.5	≤ 40	
KK	3.6	3.2		0.4	≤ 1.6	
EEE	0.55	0.80U		0.25	≤ 4.0	

Compound	Concentration (ug/L)		(≤20) RPD	Difference	Limits	Qual
	3	4				
PPP	1.3	1.3		0	≤ 40	
EEE	0.80U	0.67		0.13	≤ 4.0	

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Joliet Army Ammunition Plant

LDC Report Date: December 18, 2018

Parameters: Metals

Validation Level: Level III

Laboratory: Shealy Environmental Services, Inc.

Sample Delivery Group (SDG): TJ10017

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
JP-M13-GWMW995	TJ10017-001	Water	10/09/18
JP-M13-GWMW362	TJ10017-002	Water	10/09/18
JP-M13-GWMW994	TJ10017-003	Water	10/09/18
JP-M13-GWMW126R	TJ10017-004	Water	10/09/18
JP-M13-GWMW808	TJ10017-005	Water	10/09/18
JP-M13-GWMW809	TJ10017-006	Water	10/09/18
JP-M13-GWMW806	TJ10017-007	Water	10/09/18
JP-M13-GWMW807	TJ10017-008	Water	10/09/18
JP-M13-GWMW811	TJ10017-009	Water	10/09/18
JP-M13-GWMW808MS	TJ10017-005MS	Water	10/09/18
JP-M13-GWMW808MSD	TJ10017-005MSD	Water	10/09/18

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Appendix B - 2017 Quality Assurance Project Plan Update, Long-Term Monitoring Plan (2017 QAPP; IEA/MWH JV, July 2017), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.1 (2017), and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc by Environmental Protection Agency (EPA) SW846 Method 6010D
Mercury by EPA SW 846 Method 7470A

All sample results were subjected to Level III data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Instrument Calibration

Initial and continuing calibrations were performed as required by the methods.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

III. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks with the following exceptions:

Blank ID	Analyte	Maximum Concentration	Associated Samples
ICB/CCB	Beryllium	0.0007 mg/L	JP-M13-GWMW362 JP-M13-GWMW994 JP-M13-GWMW126R JP-M13-GWMW808 JP-M13-GWMW809
ICB/CCB	Sodium	0.6700 mg/L	JP-M13-GWMW994 JP-M13-GWMW126R JP-M13-GWMW808 JP-M13-GWMW809 JP-M13-GWMW807 JP-M13-GWMW811
ICB/CCB	Beryllium	0.0011 mg/L	JP-M13-GWMW807 JP-M13-GWMW811

Data qualification by the laboratory blanks was based on the maximum contaminant concentration in the laboratory blanks in the analysis of each analyte. The sample concentrations were either not detected or were significantly greater (>5X blank contaminants) than the concentrations found in the associated laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
JP-M13-GWMW808MS/MSD (JP-M13-GWMW808)	Potassium Sodium	119 (86-114) 123 (87-115)	- -	J (all detects) J (all detects)	A

For JP-M13-GWMW808MS/MSD, no data were qualified for Calcium percent recoveries (%R) outside the QC limits since the parent sample results were greater than 4X the spike concentration.

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

The laboratory has indicated that there were no duplicate (DUP) analyses specified for the samples in this SDG, and therefore duplicate analyses were not performed for this SDG.

VIII. Serial Dilution

Serial dilution analysis was performed on an associated project sample. The analysis criteria were met.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

Samples JP-M13-GWMW995 and JP-M13-GWMW362 and samples JP-M13-GWMW994 and JP-M13-GWMW126R were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration (mg/L)		RPD (Limits)	Difference (Limits)	Flag	A or P
	JP-M13-GWMW995	JP-M13-GWMW362				
Arsenic	0.0046	0.0048	-	0.0002 (≤0.030)	-	-
Barium	0.057	0.061	-	0.004 (≤0.050)	-	-

Analyte	Concentration (mg/L)		RPD (Limits)	Difference (Limits)	Flag	A or P
	JP-M13-GWMW995	JP-M13-GWMW362				
Cadmium	0.00090	0.00070	-	0.0002 (≤0.010)	-	-
Calcium	200	210	5 (≤25)	-	-	-
Magnesium	100	110	10 (≤25)	-	-	-
Manganese	0.19	0.20	5 (≤25)	-	-	-
Potassium	8.6	9.1	-	0.5 (≤10.0)	-	-
Sodium	530	560	6 (≤25)	-	-	-
Vanadium	0.0086	0.0089	-	0.0003 (≤0.100)		

Analyte	Concentration (mg/L)		RPD (Limits)	Difference (Limits)	Flag	A or P
	JP-M13-GWMW994	JP-M13-GWMW126R				
Arsenic	0.0046	0.0036	-	0.001 (≤0.030)	-	-
Barium	0.082	0.079	-	0.003 (≤0.050)	-	-
Calcium	93	90	3 (≤25)	-	-	-
Magnesium	53	52	2 (≤25)	-	-	-
Manganese	0.020	0.020	-	0 (≤0.030)	-	-
Potassium	3.5	3.3	-	0.2 (≤10.0)	-	-
Sodium	100	100	0 (≤25)	-	-	-

XI. Sample Result Verification

Raw data were not reviewed for Level III validation.

XII. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected in this SDG.

Due to MS/MSD %R, data were qualified as estimated in one sample.

The quality control criteria reviewed, other than those discussed above, were met and are considered acceptable. Sample results that were found to be estimated (J) are usable for limited purposes only. Based upon the data validation all other results are considered valid and usable for all purposes.

Joliet Army Ammunition Plant
Metals - Data Qualification Summary - SDG TJ10017

Sample	Analyte	Flag	A or P	Reason
JP-M13-GWMW808	Potassium Sodium	J (all detects) J (all detects)	A	Matrix spike/Matrix spike duplicate (%R)

Joliet Army Ammunition Plant
Metals - Laboratory Blank Data Qualification Summary - SDG TJ10017

No Sample Data Qualified in this SDG

Joliet Army Ammunition Plant
Metals - Field Blank Data Qualification Summary - SDG TJ10017

No Sample Data Qualified in this SDG

LDC #: 43824D4b

VALIDATION COMPLETENESS WORKSHEET

Date: 12-17-18

SDG #: TJ10017

Level III

Page: 1 of 1

Laboratory: Shealy Environmental Services, Inc.

Reviewer: MG

2nd Reviewer:

METHOD: Metals (EPA SW 846 Method 6010~~C~~D/7470A) MG

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II.	Instrument Calibration	A	
III.	ICP Interference Check Sample (ICS) Analysis	A	
IV.	Laboratory Blanks	SW	
V.	Field Blanks	N	
VI.	Matrix Spike/Matrix Spike Duplicates	SW	MS/MSD
VII.	Duplicate sample analysis	N	
VIII.	Serial Dilution	A	SD: 5
IX.	Laboratory control samples	A	LCS
X.	Field Duplicates	SW	D= 1+2 , D = 3+4
XI.	Sample Result Verification	N	
XII.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	JP-M13-GWMW995	TJ10017-001	Water	10/09/18
2	JP-M13-GWMW362	TJ10017-002	Water	10/09/18
3	JP-M13-GWMW994	TJ10017-003	Water	10/09/18
4	JP-M13-GWMW126R	TJ10017-004	Water	10/09/18
5	JP-M13-GWMW808	TJ10017-005	Water	10/09/18
6	JP-M13-GWMW809	TJ10017-006	Water	10/09/18
7	JP-M13-GWMW806	TJ10017-007	Water	10/09/18
8	JP-M13-GWMW807	TJ10017-008	Water	10/09/18
9	JP-M13-GWMW811	TJ10017-009	Water	10/09/18
10	JP-M13-GWMW808MS	TJ10017-005MS	Water	10/09/18
11	JP-M13-GWMW808MSD	TJ10017-005MSD	Water	10/09/18
12				
13				
14	PBW			

Notes:

LDC #: 43824D4b

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Reviewer: MG
2nd reviewer: [illegible]

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1→9	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
QC 10, 11	↓	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
Analysis Method		
ICP	W	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
ICP-MS		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN^-, ____

Comments: Mercury by CVAA if performed

LDC #: 43824D4b
SDG #: See Cover
METHOD: Trace metals (EPA SW 864 Method 6010D/7470A)

VALIDATION FINDINGS WORKSHEET
PB/ICB/CCB QUALIFIED SAMPLES

Soil preparation factor applied: NA

Reviewer: MG
2nd Reviewer: C

Sample Concentration units, unless otherwise noted: mg/L Associated Samples: 2-6 (ND)

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (mg/L)	Maximum ICB/CCB[a] (mg/L)	Action Limit	No Qual's.									
Be			0.0007											

Sample Concentration units, unless otherwise noted: mg/L Associated Samples: 3-6,8,9 (>LOQ)

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (mg/L)	Maximum ICB/CCB[a] (mg/L)	Action Limit	No Qual's.									
Na			0.6700											

Sample Concentration units, unless otherwise noted: mg/L Associated Samples: 8,9 (ND)

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (mg/L)	Maximum ICB/CCB[a] (mg/L)	Action Limit	No Qual's.									
Be			0.0011											

Samples with analyte concentrations within five times the associated ICB, CCB or PB concentration are listed above with the identifications from the Validation Completeness Worksheet. These sample results were qualified as not detected, "U".

Note : a - The listed analyte concentration is the highest ICB, CCB, or PB detected in the analysis of each element.

LDC #: 43824D46

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: MG
2nd Reviewer: [illegible]

METHOD: Trace metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y N N/A Were matrix spike percent recoveries (%R) within the control limits of 75-125? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

Y N N/A Were all duplicate sample relative percent differences (RPD) ≤ 20% for water samples and ≤35% for soil samples?

LEVEL IV ONLY:

Y N N/A Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	MS/MSD ID	Matrix	Analyte	MS %Recovery	MSD %Recovery	RPD (Limits)	Associated Samples	Qualifications
1	10/11	water	K	119 (86-114)			5	J dets/A (det)
	↓	↓	Na	123 (87-115)			↓	↓ (↓)

Comments: # 10/11 : Ca - 4x

MSD.4SW

LDC#: 43824D4b

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd Reviewer:

METHOD: Metals (EPA Method 6010C/7470A)

Analyte	Concentration (mg/L) 1	Concentration (mg/L) 2	RPD (≤25)	Difference	Limits	Qualifiers
Arsenic	0.0046	0.0048		0.0002	(≤0.030)	
Barium	0.057	0.061		0.004	(≤0.050)	
Cadmium	0.00090	0.00070		0.0002	(≤0.010)	
Calcium	200	210	5			
Magnesium	100	110	10			
Manganese	0.19	0.20	5			
Potassium	8.6	9.1		0.5	(≤10.0)	
Sodium	530	560	6			
Vanadium	0.0086	0.0089		0.0003	(≤0.100)	

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Analyte	Concentration (mg/L) 3	Concentration (mg/L) 4	RPD (≤25)	Difference	Limits	Qualifiers
Arsenic	0.0046	0.0036		0.001	(≤0.030)	
Barium	0.082	0.079		0.003	(≤0.050)	
Calcium	93	90	3			
Magnesium	53	52	2			
Manganese	0.020	0.020		0	(≤0.030)	
Potassium	3.5	3.3		0.2	(≤10.0)	
Sodium	100	100	0			

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Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Joliet Army Ammunition Plant

LDC Report Date: December 18, 2018

Parameters: Wet Chemistry

Validation Level: Level III

Laboratory: Shealy Environmental Services, Inc.

Sample Delivery Group (SDG): TJ10017

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
JP-M13-GWMW995	TJ10017-001	Water	10/09/18
JP-M13-GWMW362	TJ10017-002	Water	10/09/18
JP-M13-GWMW994	TJ10017-003	Water	10/09/18
JP-M13-GWMW126R	TJ10017-004	Water	10/09/18
JP-M13-GWMW808	TJ10017-005	Water	10/09/18
JP-M13-GWMW809	TJ10017-006	Water	10/09/18
JP-M13-GWMW806	TJ10017-007	Water	10/09/18
JP-M13-GWMW807	TJ10017-008	Water	10/09/18
JP-M13-GWMW811	TJ10017-009	Water	10/09/18
JP-M13-GWMW808MS	TJ10017-005MS	Water	10/09/18
JP-M13-GWMW808MSD	TJ10017-005MSD	Water	10/09/18

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Appendix B - 2017 Quality Assurance Project Plan Update, Long-Term Monitoring Plan (2017 QAPP; IEA/MWH JV, July 2017), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.1 (2017), and a modified outline of the USEPA National Functional Guidelines (NFG) for Inorganic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Sulfate and Nitrate as Nitrogen by Environmental Protection Agency (EPA) SW 846 Method 9056A

All sample results were subjected to Level III data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. For JP-M13-GWMW808MS/MSD, no data were qualified for Sulfate percent recoveries (%R) outside the QC limits since the parent sample results were greater than 4X the spike concentration. Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

The laboratory has indicated that there were no duplicate (DUP) analyses specified for the samples in this SDG, and therefore duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

IX. Field Duplicates

Samples JP-M13-GWMW995 and JP-M13-GWMW362 and samples JP-M13-GWMW994 and JP-M13-GWMW126R were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration (mg/L)		RPD (Limits)	Difference (Limits)	Flag	A or P
	JP-M13-GWMW995	JP-M13-GWMW362				
Sulfate	240	270	12 (≤25)	-	-	-

Analyte	Concentration (mg/L)		RPD (Limits)	Difference (Limits)	Flag	A or P
	JP-M13-GWMW994	JP-M13-GWMW126R				
Nitrate as N	0.010U	0.020	-	0.01 (≤0.040)	-	-
Sulfate	98	99	1 (≤25)	-	-	-

X. Sample Result Verification

Raw data were not reviewed for Level III validation.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Joliet Army Ammunition Plant
Wet Chemistry - Data Qualification Summary - SDG TJ10017

No Sample Data Qualified in this SDG

Joliet Army Ammunition Plant
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG TJ10017

No Sample Data Qualified in this SDG

Joliet Army Ammunition Plant
Wet Chemistry - Field Blank Data Qualification Summary - SDG TJ10017

No Sample Data Qualified in this SDG

LDC #: 43824D6 **VALIDATION COMPLETENESS WORKSHEET** Date: 12-17-18

SDG #: TJ10017 Level III Page: 1 of 1

Laboratory: Shealy Environmental Services, Inc. Reviewer: MG

2nd Reviewer:

METHOD: (Analyte) Sulfate, Nitrate-N (EPA SW846 Method 9056A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A	
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	N	
VI.	Matrix Spike/Matrix Spike Duplicates	A	MS/MSD (SO4-4x)
VII.	Duplicate sample analysis	N	~~DUP~~
VIII.	Laboratory control samples	A	LCS
IX.	Field duplicates	SW	D=1+2, D=3+4
X.	Sample result verification	N	
XI.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	JP-M13-GWMW995	TJ10017-001	Water	10/09/18
2	JP-M13-GWMW362	TJ10017-002	Water	10/09/18
3	JP-M13-GWMW994	TJ10017-003	Water	10/09/18
4	JP-M13-GWMW126R	TJ10017-004	Water	10/09/18
5	JP-M13-GWMW808	TJ10017-005	Water	10/09/18
6	JP-M13-GWMW809	TJ10017-006	Water	10/09/18
7	JP-M13-GWMW806	TJ10017-007	Water	10/09/18
8	JP-M13-GWMW807	TJ10017-008	Water	10/09/18
9	JP-M13-GWMW811	TJ10017-009	Water	10/09/18
10	JP-M13-GWMW808MS	TJ10017-005MS	Water	10/09/18
MG 11	JP-M13-GWMW808~~DUP~~ MSD	TJ10017-005~~DUP~~ MSD	Water	10/09/18
12				
13				
14	PBW1			
15	PBW2			

Notes:

LDC #: 43824D6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Reviewer: MG
2nd reviewer: [illegible]

All circled methods are applicable to each sample.

Sample ID	Matrix	Parameter
1→9	W	pH TDS Cl F (NO$_3$) NO$_2$ (SO$_4$) PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
QC 10, 11	↓	pH TDS Cl F (NO$_3$) NO$_2$ (SO$_4$) PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
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		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____
		pH TDS Cl F NO$_3$ NO$_2$ SO$_4$ PO$_4$ ALK CN$^-$ NH$_3$ TKN TOC CR^{6+} ClO$_4$ ____ ____

Comments: _____

LDC#: 43824D6

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: MG
2nd Reviewer:

Inorganics, Method: 9056A

Analyte	Concentration (mg/L)		RPD (≤25)	Difference	Limits	Qualification (Parent only)
	1	2				
Sulfate	240	270	12			

V:\FIELD DUPLICATES\Field Duplicates\FD_inorganic\2018\43824D6.wpd

Analyte	Concentration (mg/L)		RPD (≤25)	Difference	Limits	Qualification (Parent only)
	3	4				
Nitrate as N	0.010U	0.020		0.01	(≤0.040)	
Sulfate	98	99	1			

V:\FIELD DUPLICATES\Field Duplicates\FD_inorganic\2018\43824D6.wpd

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Joliet Army Ammunition Plant

LDC Report Date: December 19, 2018

Parameters: Explosives

Validation Level: Level III

Laboratory: Shealy Environmental Services, Inc.

Sample Delivery Group (SDG): TJ10017

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
JP-M13-GWMW995	TJ10017-001	Water	10/09/18
JP-M13-GWMW362	TJ10017-002	Water	10/09/18
JP-M13-GWMW994	TJ10017-003	Water	10/09/18
JP-M13-GWMW126R	TJ10017-004	Water	10/09/18
JP-M13-GWMW808	TJ10017-005	Water	10/09/18
JP-M13-GWMW809	TJ10017-006	Water	10/09/18
JP-M13-GWMW806	TJ10017-007	Water	10/09/18
JP-M13-GWMW807	TJ10017-008	Water	10/09/18
JP-M13-GWMW811	TJ10017-009	Water	10/09/18
JP-M13-GWMW808MS	TJ10017-005MS	Water	10/09/18
JP-M13-GWMW808MSD	TJ10017-005MSD	Water	10/09/18

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Appendix B - 2017 Quality Assurance Project Plan Update, Long-Term Monitoring Plan (2017 QAPP; IEA/MWH JV, July 2017), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.1 (2017), and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Explosives by Environmental Protection Agency (EPA) SW 846 Method 8330A

All sample results were subjected to Level III data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0% for all compounds.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 15.0% for all compounds.

III. Continuing Calibration

Continuing calibration was performed at required frequencies.

The percent differences (%D) were less than or equal to 15.0% for all compounds.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

IX. Field Duplicates

Samples JP-M13-GWMW995 and JP-M13-GWMW362 and samples JP-M13-GWMW994 and JP-M13-GWMW126R were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Compound	Concentration (ug/L)		RPD (Limits)	Difference (Limits)	Flag	A or P
	JP-M13-GWMW995	JP-M13-GWMW362				
4-Amino-2,6-dinitrotoluene	1.0	1.1	-	0.1 (≤1.0)	-	-
2-Amino-4,6-dinitrotoluene	1.4	1.4	-	0 (≤10)	-	-
2,4-Dinitrotoluene	6.9	6.7	3 (≤25)	-	-	-
2,6-Dinitrotoluene	0.55	0.52	-	0.03 (≤0.30)	-	-

X. Compound Quantitation

Raw data were not reviewed for Level III validation.

XI. Target Compound Identifications

Raw data were not reviewed for Level III validation.

XII. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Joliet Army Ammunition Plant
Explosives - Data Qualification Summary - SDG TJ10017

No Sample Data Qualified in this SDG

Joliet Army Ammunition Plant
Explosives - Laboratory Blank Data Qualification Summary - SDG TJ10017

No Sample Data Qualified in this SDG

Joliet Army Ammunition Plant
Explosives - Field Blank Data Qualification Summary - SDG TJ10017

No Sample Data Qualified in this SDG

LDC #: 43824D40 **VALIDATION COMPLETENESS WORKSHEET** Date: 12/18/18

SDG #: TJ10017 Level III Page: 1 of 1

Laboratory: Shealy Environmental Services, Inc. Reviewer: 5

2nd Reviewer:

METHOD: HPLC Explosives (EPA SW 846 Method 8330A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A/A	
II.	Initial calibration/ICV	A/A	% RSD ≤ 20 ICV ≤ 15
III.	Continuing calibration	A	CCV ≤ 15
IV.	Laboratory Blanks	A	
V.	Field blanks	N	
VI.	Surrogate spikes	A	
VII.	Matrix spike/Matrix spike duplicates	A	
VIII.	Laboratory control samples	A	LCS
IX.	Field duplicates	SW	D = 1,2 * 3,4
X.	Compound quantitation RL/LOQ/LODs	N	
XI.	Target compound identification	N	
XII.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	JP-M13-GWMW995 D	TJ10017-001	Water	10/09/18
2	JP-M13-GWMW362 D	TJ10017-002	Water	10/09/18
3	JP-M13-GWMW994 D1	TJ10017-003	Water	10/09/18
4	JP-M13-GWMW126R D1	TJ10017-004	Water	10/09/18
5	JP-M13-GWMW808	TJ10017-005	Water	10/09/18
6	JP-M13-GWMW809	TJ10017-006	Water	10/09/18
7	JP-M13-GWMW806	TJ10017-007	Water	10/09/18
8	JP-M13-GWMW807	TJ10017-008	Water	10/09/18
9	JP-M13-GWMW811	TJ10017-009	Water	10/09/18
10	JP-M13-GWMW808MS	TJ10017-005MS	Water	10/09/18
11	JP-M13-GWMW808MSD	TJ10017-005MSD	Water	10/09/18
12				
13	86078			
14				
15				
16				

VALIDATION FINDINGS WORKSHEET

METHOD: ____GC ___✓HPLC

8310	8330	8151	8141	8141(Con't)	8021B
A. Acenaphthene	A. HMX	A. 2,4-D	A. Dichlorvos	X. EPN	V. Benzene
B. Acenaphthylene	B. RDX	B. 2,4-DB	B. Mevinphos	Y. Azinphos-methyl	CC. Toluene
C. Anthracene	C. 1,3,5-Trinitrobenzene	C. 2,4,5-T	C. Demeton-O	Z. Coumaphos	EE. Ethyl Benzene
D. Benzo(a)anthracene	D. 1,3-Dinitrobenzene	D. 2,4,5-TP	D. Demeton-S	AA. Parathion	SSS. O-Xylene
E. Benzo(a)pyrene	E. Tetryl	E. Dinoseb	E. Ethoprop	BB. Trichloronate	RRR. MP-Xylene
F. Benzo(b)fluoranthene	F. Nitrobenzene	F. Dichlorprop	F. Naled	CC. Trichlorinate	GG. Total Xylene
G. Benzo(g,h,i)perylene	G. 2.4.6-Trinitrotoluene	G. Dicamba	G. Sulfotep	DD. Trifluralin	
H. Benzo(k)fluoranthene	H. 4-Amino-2,6-dinitrotoluene	H. Dalapon	H. Phorate	EE. Def	**8315A**
I. Chrysene	I. 2-Amino-4,6-dinitrotoluene	I. MCPP	I. Dimethoate	FF. Prowl	A. Formaldehyde
J. Dibenz(a,h)anthracene	J. 2,4-Dinitrotoluene	J. MCPA	J. Diazinon	GG. Ethion	B. Acetaldehyde
K. Fluoranthene	K. 2,6-Dinitrotoluene	K. Pentachlorophenol	K. Disulfoton	HH. Famphur	C. Benzaldehyde
L. Fluorene	L. 2-Nitrotoluene	L. 2,4,5-TP (silvex)	L. Parathion-methyl	II. Phosmet	D. Butyraldehyde
M. Indeno(1,2,3-cd)pyrene	M. 3-Nitrotoluene	M. Silvex	M. Ronnel	JJ. Tetrachlorvinphos	
N. Naphthalene	N. 4-Nitrotoluene	N.	N. Malathion	KK. Demeton (total)	
O. Phenanthrene	O. Nitroglycerin	O.	O. Chlorpyrifos		
P. Pyrene	P. Picric acid	P.	P. Fenthion		
Q.	Q. 2,4-Dinitrophenol	Q.	Q. Parathion-ethyl		
R.	R. 3,5-Dinitroaniline		R. Trichlornate		
S.	S. 2-Nitrophenol		S. Merphos		
	T. 4-Nitrophenol		T. Stirofos		
	U. Picramic acid		U. Tokuthion		
	V. PETN		V. Fensulfothion		
			W. Bolstar		

Notes:_____

LDC#: 43824D40

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Page: 1 of 1
Reviewer: [illegible]
2nd Reviewer: [illegible]

METHOD: HPLC 8330A

Compound	Concentration (ug/L)		(≤20) RPD	Difference	Limits	Qual
	1	2				
H	1.0	1.1		0.1	≤ 1.0	
I	1.4	1.4		0	≤ 10	
J	6.9	6.7	3			
K	0.55	0.52		0.03	≤ 0.30	

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Joliet Army Ammunition Plant

LDC Report Date: December 19, 2018

Parameters: Explosives

Validation Level: Level III

Laboratory: Shealy Environmental Services, Inc.

Sample Delivery Group (SDG): TJ11067

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
JP-OA-GWMW117	TJ11067-001	Water	10/10/18
JP-OA-GWMW118	TJ11067-002	Water	10/10/18
JP-OA-GWMW119	TJ11067-003	Water	10/10/18
JP-OA-GWMW118MS	TJ11067-002MS	Water	10/10/18
JP-OA-GWMW118MSD	TJ11067-002MSD	Water	10/10/18
JP-OA-GWMW119MS	TJ11067-003MS	Water	10/10/18
JP-OA-GWMW119MSD	TJ11067-003MSD	Water	10/10/18

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Appendix B - 2017 Quality Assurance Project Plan Update, Long-Term Monitoring Plan (2017 QAPP; IEA/MWH JV, July 2017), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.1 (2017), and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Explosives by Environmental Protection Agency (EPA) SW 846 Method 8330A

All sample results were subjected to Level III data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detect at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0% for all compounds.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 15.0% for all compounds.

III. Continuing Calibration

Continuing calibration was performed at required frequencies.

The percent differences (%D) were less than or equal to 15.0% for all compounds.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Compound Quantitation

Raw data were not reviewed for Level III validation.

XI. Target Compound Identifications

Raw data were not reviewed for Level III validation.

XII. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Joliet Army Ammunition Plant
Explosives - Data Qualification Summary - SDG TJ11067

No Sample Data Qualified in this SDG

Joliet Army Ammunition Plant
Explosives - Laboratory Blank Data Qualification Summary - SDG TJ11067

No Sample Data Qualified in this SDG

Joliet Army Ammunition Plant
Explosives - Field Blank Data Qualification Summary - SDG TJ11067

No Sample Data Qualified in this SDG

LDC #: 43824E40 **VALIDATION COMPLETENESS WORKSHEET** Date: 12/18/18

SDG #: TJ11067 Level III Page: 1 of 1

Laboratory: Shealy Environmental Services, Inc. Reviewer: [illegible]

2nd Reviewer: [illegible]

METHOD: HPLC Explosives (EPA SW 846 Method 8330A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A/A	
II.	Initial calibration/ICV	A/A	% RSD ≤ 20 ICV ≤ 15
III.	Continuing calibration	A	CCV ≤ 15
IV.	Laboratory Blanks	A	
V.	Field blanks	N	
VI.	Surrogate spikes	A	
VII.	Matrix spike/Matrix spike duplicates	A	
VIII.	Laboratory control samples	A	LCS
IX.	Field duplicates	N	
X.	Compound quantitation RL/LOQ/LODs	N	
XI.	Target compound identification	N	
XII.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	JP-OA-GWMW117	TJ11067-001	Water	10/10/18
2	JP-OA-GWMW118	TJ11067-002	Water	10/10/18
3	JP-OA-GWMW119	TJ11067-003	Water	10/10/18
4	JP-OA-GWMW118MS	TJ11067-002MS	Water	10/10/18
5	JP-OA-GWMW118MSD	TJ11067-002MSD	Water	10/10/18
6	JP-OA-GWMW119MS	TJ11067-003MS	Water	10/10/18
7	JP-OA-GWMW119MSD	TJ11067-003MSD	Water	10/10/18
8				
9				
10				
11				
12				

Notes:

	86628						

C2 – DATA USABILITY REPORT

Former Joliet Army Ammunition Plant
Will County, Illinois

Appendix C2
Data Usability Report
Groundwater and Surface Water Sampling – October 2018

Long-Term Monitoring, Deed Restriction Implementation Plan, and CERCLA Five-Year Review

Prepared For:
U.S. Army Environmental Command under Contract with the U.S. Army Corps Of Engineers

Firm Fixed Price Contract
W912QR-15-C-0016

October 2018

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APPENDIX C2

DATA USABILITY REPORT

TABLE OF CONTENTS

Section **Page**

ACRONYMS AND ABBREVIATIONS ii

1.0 INTRODUCTION C2-1

2.0 LABORATORY QA/QC ELEMENTS C2-4

3.0 EVALUATION OF MEASUREMENT QUALITY OBJECTIVES C2-6
- 3.1 COMPLETENESS C2-7
- 3.2 SENSITIVITY C2-8
- 3.3 TRACEABILITY C2-8
- 3.4 DATA QUALIFIERS C2-8
- 3.5 CONCLUSIONS C2-8

4.0 REFERENCES C2-9

LIST OF TABLES

Table No.

1 Summary of Qualified Results

ACRONYMS AND ABBREVIATIONS

%D	percent difference
%R	percent recovery
CCB	continuing calibration blank
CCV	continuing calibration verification
DL	detection limit
DO	dissolved oxygen
DoD	Department of Defense
FSP	Final Appendix A – 2017 Field Sampling Plan Update (IEA/MWH JV, June 2017)
GC/MS	gas chromatography/mass spectroscopy
HMX	high melting point explosive
ICAL	initial calibration
ICB	initial calibration blank
ICS	interference check sample
ICSAB	interference check standard AB solution
ICV	initial calibration verification
IEA/MWH JV	IEA Inc./MWH Americas, Inc. Joint Venture
J	estimated value
JOAAP	former Joliet Army Ammunition Plant
LCS/LCSD	laboratory control sample/laboratory control sample duplicate
LDC	Laboratory Data Consultants, Inc.
LOD	limit of detection
LOQ	limit of quantitation
MS/MSD	matrix spike/matrix spike duplicate
ORP	oxidation/reduction potential
QA	quality assurance
2017 QAPP	Final Appendix B – 2017 Quality Assurance Project Plan Update (IEA/MWH JV, July 2017)
QC	quality control
QSM	Quality Systems Manual
R	rejected
RDX	1,3,5-Trinitro-1,3,5-triazinane
RPD	relative percent difference
SDG	sample delivery group
Shealy	Shealy Environmental Services, Inc.
SVOC	semi-volatile organic compound
TAL	target analyte list
U	not detected
UJ	not detected; estimated quantitation limit
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound

APPENDIX C2

DATA USABILITY REPORT

1.0 INTRODUCTION

The following Data Usability Report discusses quality assurance/quality control (QA/QC) outliers for each analyte group and summarizes the Data Validation Reports presented in Appendix C1. Data qualifiers were added to results and imported into the former Joliet Army Ammunition Plant (JOAAP) database. Data qualifiers used in the validation process may include the following:

- U – Not detected. The compound or analyte was analyzed for and positively identified by the laboratory; however, the compound or analyte should be considered not detected at the reported concentration due to the presence of contaminants detected in the associated blank(s);
- J – Estimated value. The compound or analyte was analyzed for and positively identified by the laboratory; however, the reported concentration is estimated due to non-conformances discovered during data validation;
- UJ – Not detected; estimated quantitation limit. The compound or analyte was reported as not detected by the laboratory; however, the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation;
- R – Rejected. The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected are not usable.

Shealy Environmental Services, Inc. (Shealy), located at 106 Vantage Point Drive, West Columbia, South Carolina, performed the analyses of groundwater and surface water samples collected in October 2018 at JOAAP in Will County, Illinois. Groundwater and surface water samples were analyzed for one or more of the following parameters:

- Volatile organic compounds (VOCs) were analyzed by SW-846 Method 8260B;
- Semi-volatile organic compounds (SVOCs) were analyzed by SW-846 Method 8270D;
- Explosives were analyzed by SW-846 Method 8330A;
- Target analyte list (TAL) metals were analyzed by SW-846 Methods 6010D and 7470A;
- Sulfate was analyzed by SW-846 Method 9056A;
- Nitrate was analyzed by SW-846 Method 9056A.

Groundwater was collected from ten sites (L1, L2, L3, L14, M1, M6 (including Other Areas), M8, M11 Landfill, and M13 Landfill) and analyzed for the following parameters:

- VOCs were analyzed from Sites M11 and M13 Landfills;
- SVOCs were analyzed from Sites M11 and M13 Landfills;

- Explosives were analyzed from Sites L1, L2, L3, L14, M6 (including Other Areas), and M11 and M13 Landfills;
- TAL metals were analyzed at Sites M11 and M13 Landfills;
- Sulfate was analyzed at Sites M1, M8, and M11 and M13 Landfills;
- Nitrate was analyzed at Sites M11 and M13 Landfills.

Surface water was collected from four sites at JOAAP and analyzed for the following parameters:

- Explosives were analyzed from Sites L1, L2, and L3;
- Sulfate was analyzed from Site M1.

Field parameters are not discussed in this Data Usability Report, but were recorded by field personnel with a water quality meter at the time of sample collection and included:

- pH, temperature, specific conductivity, dissolved oxygen (DO), turbidity, and oxidation/reduction potential (ORP).

The following summarizes the sample delivery group (SDG) and corresponding data validation report:

Sample Delivery Group	Data Validation Report	Associated Samples
TJ03033	JOAAP Data Validation Report - December 21, 2018	JP-M11-GWMW335 JP-M11-GWMW804 JP-M11-GWMW805 JP-M11-GWMW336 JP-M11-GWMW334 JP-M11-GWMW333 JP-M11-GWMW803 JP-M11-GWMW802 JP-M1-GWMW107 JP-M1-GWMW640 JP-L1-GWMW173 JP-L1-GWMW174 JP-L1-GWMW131 JP-L1-GWWES3 JP-L1-GWWES1 JP-L1-GW550 JP-L14-GWH7 JP-L14-GWMW512 JP-L14-GWMW511
TJ06011	JOAAP Data Validation Report - December 21, 2018	JP-M1-GWMW231 JP-M1-GWMW999 (Dup of M1-MW231) JP-M1-GWMW645 JP-M1-GWMW646

Sample Delivery Group	Data Validation Report	Associated Samples
		JP-M1-GWMW649 JP-M1-GWMW641 JP-M1-SW709 JP-M1-GWMW642 JP-M1-GWMW643 JP-M1-GWMW644 JP-L2-GWMW620 JP-L2-GWMW621 JP-L2-GWMW404 JP-L2-GWMW998 (Dup of L2-MW404) JP-L2-SW555 JP-M6-GWMW652 JP-M6-GWMW654 JP-M6-GWMW313 JP-M6-GWMW123R JP-M6-GWMW162R JP-M6-GWMW318 JP-M6-GWMW319
TJ09009	JOAAP Data Validation Report - December 21, 2018	JP-M8-GWMW330 JP-L3-GWMW412 JP-L3-GWMW630 JP-L3-GWMW631 JP-L3-GWMW633 JP-L3-SW777 JP-L3-GWMW997 (Dup of L3-MW412) JP-M6-GWMW212R JP-M6-GWMW996 (Dup of M6-MW212R)
TJ10017	JOAAP Data Validation Report - December 21, 2018	JP-M13-GWMW995 (Dup of M13-MW362) JP-M13-GWMW362 JP-M13-GWMW994 (Dup of M13-MW126R) JP-M13-GWMW126R JP-M13-GWMW806 JP-M13-GWMW807 JP-M13-GWMW809 JP-M13-GWMW808 JP-M13-GWMW811
TJ11067	JOAAP Data Validation Report - December 21, 2018	JP-OA-GWMW117 JP-OA-GWMW118 JP-OA-GWMW119

2.0 LABORATORY QA/QC ELEMENTS

Laboratory Data Consultants, Inc. (LDC) performed the equivalent of United States Environmental Protection Agency (USEPA) Level III validation on 90% of the data, and Level IV on the remaining 10% of the data (which includes an evaluation of all Level III items) in accordance with the *Final Appendix B – 2017 Quality Assurance Project Plan Update, Long-Term Monitoring Plan* (2017 QAPP; IEA Inc./MWH Americas, Inc. Joint Venture [IEA/MWH JV], July 2017); the USEPA National Functional Guidelines for Superfund Organic Methods Data Review (USEPA, 2017); the USEPA National Functional Guidelines for Inorganic Superfund Data Review (USEPA, 2017); USEPA SW-846 Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, Third Edition (USEPA, 1986) and updates; and the Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.1 (DoD, 2017) validation guidelines, as appropriate. QAPP Worksheets #34, #35, and #36 describe the verification process, and QAPP Worksheet #37 describes the data usability assessment.

Data were evaluated for precision, accuracy, representativeness, comparability, and completeness based on results of the following QA/QC samples and parameters, where applicable:

- Sample preservation;
- Sample holding times;
- Surrogate spikes (organics);
- Laboratory control sample/laboratory control sample duplicate (LCS/LCSD);
- Matrix spike/matrix spike duplicate (MS/MSD);
- Matrix duplicate for metals;
- Laboratory duplicate samples;
- Gas chromatography/mass spectroscopy (GC/MS) tunes (organics);
- Internal standards (organics);
- Initial calibration (ICAL) standards;
- Initial calibration verification (ICV) standards;
- Continuing calibration verification (CCV) standards;
- Interference check samples (ICSs; metals);
- Trip blanks (VOCs);
- Serial dilution (metals);
- Method blanks;
- Initial calibration blanks (ICBs);
- Continuing calibration blanks (CCBs);
- Post digestion spikes (metals).

The following field QA/QC samples were collected and analyzed:

- One field duplicate per ten field samples collected, or fewer;
- One MS/MSD (extra sample volume) per twenty field samples collected, or fewer;
- Trip blanks included with each cooler containing VOC samples.

Samples were stored in coolers on wet ice, then shipped to Shealy in West Columbia, South Carolina under proper chain-of-custody documentation.

3.0 EVALUATION OF MEASUREMENT QUALITY OBJECTIVES

For each analytical method, laboratory QA/QC results were compared to the established acceptance limits. Refer to the associated Data Validation Reports presented in Appendix C1 for analysis of the below criteria for each individual SDG and associated samples. The parameters reviewed by method within the Data Validation Report for each SDG are outlined as follows:

- Precision was quantitatively evaluated by reviewing the relative percent differences (RPDs) for the following QA/QC samples:
  - MS/MSDs;
  - Matrix duplicate (metals);
  - LCS/LCSDs;
  - Laboratory duplicate samples;
  - Serial dilution (metals);
  - Field duplicate samples;
  - Primary and secondary column confirmation (explosives).
- Accuracy was quantitatively evaluated by comparing the percent recovery (%R) or percent difference (%D) for the following QA/QC samples or parameters:
  - Surrogate spikes (VOCs, SVOCs, and explosives);
  - Internal standards (VOCs and SVOCs);
  - ICVs;
  - CCVs;
  - MS/MSDs;
  - LCSs;
  - ICSs (metals);
  - Post digestion spike (metals).

Refer to QAPP Worksheet #12 (Method Performance Criteria Table) and QAPP Worksheet #28 (QC Samples Table) for QC samples analyzed and criteria limits.

Representativeness was evaluated through a review of the following QA/QC elements:

- Sample preservation
- Sample holding times
- Compliance with sample collection, handling, and analysis methods specified in the *Final Appendix A – 2017 Field Sampling Plan Update, Long-Term Monitoring Plan* (FSP; IEA/MWH JV, June 2017).

Samples for TAL metals were anlayzed using Method 6010D, not the QAPP specified Method 6010C due to the promulgation of the updated method and the laboratory's use of the most current method. Method 6010C requires an interference check standard AB solution (ICSAB) and a low-level CCV (+/- 30%) of the true value of the limit of quantitation (LOQ) at the beginning and end of the sequence. Whereas, Method 6010D requires a percent recovery of +/- 20% at all standards except the mid-point which is +/- 10%. The Method 6010D calibration must contain an ICAL point at or below the required LOQ. However, this has no impact on the quality of the data as the data was validated based on the analytical method utilized. Refer to QAPP Worksheets #21 through #27 for evaluation criteria related to representativeness.

Comparability was qualitatively evaluated through a review of the following QA/QC elements:

- Sample collection and handling procedures;
- Sample preparation, analysis, and quantitation procedures;
- Units of measure.

Refer to QAPP Worksheets #21 through #27 for evaluation criteria related to comparability. Comparability was acceptable for the October 2018 sampling event.

3.1 COMPLETENESS

Completeness was calculated by dividing the number of acceptable sample results by the total number of scheduled sample results based on the precision and accuracy results of the validation as summarized in Table 1. All scheduled and planned samples were collected and analyzed. The completeness goal for holding times is 100%. Holding times were met for all analytes in the October 2018 sampling round, with the exception of two VOC samples; one in SDG TJ03033 (M11-MW805) and one in SDG TJ10017 (M13-MW811). For these samples, due to insufficient preservation in the sample when received by the laboratory, the holding time used for evaluation was seven days. The sample results were qualified "UJ" for non-detects. Since the data was not rejected, the completeness goal of 100% for holding times was met. However, while 100% completeness was met, as no data was rejected, there were instances of holding times not being met for two samples.

The laboratory completeness goal for the number of acceptable sample results compared to the total sample results is 95%. Completeness is calculated on a per analyte/compound basis. Only results qualified "R" as unusable were considered unacceptable sample results for calculating laboratory completeness. Sample results qualified "J" as estimated, "U" as not detected, or "UJ" as not detected estimated quantitation limit were considered quantitative and acceptable. Completeness for all analysis was 100%; with the exception of the SVOCs, which was 99.65% due to benzidine and 3,3'-dichlorobenzidine in sample JP-M11-GWMW335 in SDG TJ03033 and sample JP-M13-GWMW808 in SDG TJ10017 being rejected because of the MS/MSD %R below 10%. Completeness for the sampling event was 99.89%.

Refer to QAPP Worksheet #37 for the data usability criteria.

3.2 SENSITIVITY

Sensitivity was evaluated by comparing LOQ, limit of detection (LOD), and detection limit (DL) with the appropriate QAPP criteria. Samples for metals were anlayzed using method 6010D instead of method 6010C as specified in the QAPP. The laboratory LOQs met the PALs for Method 6010D. The laboratory LOQs for Method 6010D are the same as those for Method 6010C. In samples not requiring dilutions, adequate sensitivity was demonstrated with LOQs equal to or less than the associated criteria. Refer to QAPP Worksheet #15 the Reference Limits and Evaluation Table for compound-specific LOQs, LODs, DLs, and project action limits.

3.3 TRACEABILITY

Traceability was evaluated by reviewing field documentation, chain-of-custody documentation, and analytical reports. Each sample was found to be traceable from collection through analysis.

3.4 DATA QUALIFIERS

Refer to Tables 3-1 through 3-5 of this 2018 Annual Groundwater Monitoring Report for summaries of groundwater and surface water data. Refer to Appendix C1 for the Data Validation Reports associated with each SDG. Table 1 of Appendix C2 provides a summary of all reported data that has been qualified.

3.5 CONCLUSIONS

As discussed in Section 3.1, completeness goals were met for the October 2018 analytical data. The holding time completeness was 100% and the acceptability completeness was 99.89% for all data due to the rejection of 3,3'-dichlorobenzidine and benzidine in two samples. No project action limits have been established for these two compounds and they are not compounds of concern for this project. The data complies with contract requirements. The data that did not meet QA criteria and were qualified as estimated data with a "J" or "UJ" are considered usable and do not negatively impact the project objectives. There were no biases or trends observed in this dataset.

4.0 REFERENCES

DoD, 2017. *Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.1*. 2017.

IEA/MWH JV, 2017. *Final Appendix A - 2017 Field Sampling Plan Update, Long-Term Monitoring Plan* (IEA/MWH JV, June 2017).

IEA/MWH JV, 2017. *Final Appendix B - 2017 Quality Assurance Project Plan Update, Long-Term Monitoring Plan* (IEA/MWH JV, July 2017).

USEPA, 1986. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, Third Edition*. November 1986.

USEPA, 2017. *USEPA National Functional Guidelines for Superfund Organic Methods Data Review*. January 2017.

USEPA, 2014. *USEPA National Functional Guidelines for Inorganic Superfund Data Review*. AJanuary 2017.

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APPENDIX C2
TABLE 1

Summary of Qualified Results
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

Analysis	Failed Criteria	Compound	Result	Associated Samples	SDG	Flag
Sampling Conducted October 2018						
VOCs	Holding time	All compounds	6 days past holding time from sample collection to analysis	JP-M11-GWMW805	TJ03033	UJ (all non-detects)
VOCs	Continuing Calibration	Acetone	%D = 25.5	All Samples	TJ03033	J (detects) UJ (non-detects)
VOCs	Trip Blank	Acetone	2.1 µg/L	All samples in SDG	TJ03033	None - sample concentrations either non-detect or 10x greater than blank concentration
VOCs	Surrogate Toluene -d8	All compounds	%R = 114	JP-M11-GWMW335	TJ03033	NA
SVOCs	ICV	2-methylphenol benzidine	%D = 20.1 %D = 20.3	All samples in SDG	TJ03033	UJ (all non-detects)
SVOCs	Continuing Calibration	Aniline 2,4-dinitrophenol benzidine	%D = 43.7 %D = 22.1 %D = 31.3	All samples in SDG	TJ03033	UJ (all non-detects)
SVOCs	MS/MSD %R	aniline phenol benzidine 3,3-dichlorobenzidine	%R = 22/21 %R = 46/- %R = 0/0 %R = 0/0	JP-M11-GWMW335	TJ03033	UJ (all non-detects) UJ (all non-detects) R (all non-detects) R (all non-detects)
SVOCS	MS/MSD RPD	benzyl alcohol	RPD = 75	JP-M11-GWMW335	TJ03033	NA
Metals	Preparation Blank	arsenic	0.0035 mg/L	All samples in SDG	TJ03033	None - sample concentrations either non-detect or 5x greater than blank concentration with the exception of: JP-M11-GWMW335 - U JP-M11-GWMW334 - U JP-M11-GWMW802 - U

APPENDIX C2
TABLE 1

Summary of Qualified Results
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

Analysis	Failed Criteria	Compound	Result	Associated Samples	SDG	Flag
Metals	ICB/CCB	vanadium	0.0066 mg/L	JP-M11-GWWMW335 JP-M11-GWMW804 JP-M11-GWMW805 JP-M11-GWMW336 JP-M11-GWMW334	TJ03033	None - sample concentrations either non-detect or 5x greater than blank concentration with the exception of: JP-M11-GWMW335 - U
Metals	ICB/CCB	vanadium	0.0067 mg/L	JP-M11-GWMW333 JP-M11-GWMW803 JP-M11-GWMW802	TJ03033	None - sample concentrations either non-detect or 5x greater than blank concentration with the exception of: JP-M11-GWMW802 - U
Metals	ICB/CCB	lead	0.0055 mg/L	JP-M11-GWWMW335 JP-M11-GWMW804 JP-M11-GWMW805	TJ03033	None - sample concentrations either non-detect or 5x greater than blank concentration with the exception of: JP-M11-GWMW336 - U
Metals	ICB/CCB	sodium	0.6575 mg/L	JP-M11-GWMW336 JP-M11-GWMW334 JP-M11-GWMW333 JP-M11-GWMW803 JP-M11-GWMW802	TJ03033	None - sample concentrations either non-detect or 5x greater than blank concentration
Metals	MS/MSD %R	calcium iron magnesium	%R = -/71 %R = -/86 %R = -/76	JP-M11-GWMW802	TJ03033	J (all detects)
Explosives	Compound Quantitation (RPD between two columns)	HMX	RPD = 57.72	JP-L1-GWMW173	TJ03033	J (all detects)
Explosives	Compound Quantitation (RPD between two columns)	RDX	RPD = 167.41	JP-L1-GWWES3	TJ03033	J (all detects)
Explosives	Compound Quantitation (RPD between two columns)	2,4-dinitrotoluene 2,6-dinitrotoluene	RPD = 49.35 RPD = 94.41	JP-L1-GWWES1	TJ03033	J (all detects)
Explosives	Compound Quantitation (RPD between two columns)	RDX	RPD = 58.08	JP-l14-GWH&	TJ03033	J (all detects)

APPENDIX C2
TABLE 1

Summary of Qualified Results
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

Analysis	Failed Criteria	Compound	Result	Associated Samples	SDG	Flag
Explosives	Surrogate 1,2-dinitrobenzene	All compounds	%R = 122	JP-M6-GWMW318	TJ06011	J (all detects)
Explosives	Compound Quantitation (RPD between two columns)	2,4,6-trinitrotoluene	RPD = 94.11	JP-MW-GWMW123R	TJ06011	J (all detects)
Explosives	Compound Quantitation (RPD between two columns)	2-nitrotoluene	RPD = 177.91	JP-M6-GWMW318	TJ06011	J (all detects)
Sulfate	ICB/CCB	Sulfate	0.23895 mg/L	All samples in SDG	TJ06011	None - The sample concentrations were either not detected or were significantly greater (>5x blank contaminants) than the concentrations found in the associated blanks
Explosives	Duplicates	2,4-dinitrotoluene 2,6-dinitrotoluene 3-nitrotoluene 4-nitrotoluene	RPD = 26 RPD = 28 RPD = 33 RPD = 31	JP-M6-GWMW-212R/ JP-M6-GWMW-996	TJ06011	J (all detects)
Explosives	Compound Quantitation (RPD between two columns)	2-amino-4,6-dinitrotoluene	RPD = 41.01	JP-M6-GWMW-212R	TJ06011	J (all detects)
VOCs	Holding time	All compounds	4 days past holding time from sample collection to analysis	JP-M13-GWMW811	TJ10017	UJ (all non-detects)
SVOCs	ICV	2-methylphenol benzidine	%D = 20.1 %D = 20.3	All samples in SDG	TJ10017	UJ (all non-detects)
SVOCs	Continuing Calibration	Aniline 2,4-dinitrophenol benzidine	%D = 43.7 %D = 22.1 %D = 31.3	JP-M13-GWMW995 JP-M13-GWMW362 JP-M13-GWMW126R JP-M13-GWMW806 JP-M13-GWMW807 JP-M13-GWMW809 JP-M13-GWMW808 JP-M13-GWMW811	TJ10017	UJ (all non-detects)

APPENDIX C2
TABLE 1

Summary of Qualified Results
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

Analysis	Failed Criteria	Compound	Result	Associated Samples	SDG	Flag
SVOCs	Continuing Calibration	Aniline 4,6-dinitro-2-methylphenol benzidine	%D = 44.3 %D = 25.4 %D = 21.4	JP-M13-GWMW994	TJ10017	UJ (all non-detects)
SVOCs	MS/MSD % R	aniline benzyl alcohol bis(2-chloro-1-methylethyl)ether bis(2-chloroethoxy)methane 2-chlorophenol 1,2-dichlorobenzene 1,3-dichlorobenzene 1,4-dichlorobenzene benzidine 3,3'-dichlorobenzidine	%R = -/24 %R = -/42 %R = -/31 %R = -/40 %R = -/27 %R = -/20 %R = -/18 %R = -/19 %R = 0/0 %R = 0/9.3	JP-M13-GWMW808	TJ10017	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) UJ (all non-detects) R (all non-detects) R (all non-detects)
SVOCs	RPD	acenaphthene acenaphthylene 'aniline benzyl alcohol bis(2-chloro-1-methylethyl)ether 4-chloroaniline bis(2-chloroethoxy)methane 2-chlorophenol 1,2-dichlorobenzene 1,3-dichlorobenzene 1,4-dichlorobenzene 3,3'-dichlorobenzidine 2,4-dichlorophenol	RPD = 21 RPD = 24 RPD = 72 RPD = 30 RPD = 63 RPD = 37 RPD = 42 RPD = 62 RPD = 93 RPD = 99 RPD = 94 RPD = 200 RPD = 24	JP-M13-GWMW808	TJ10017	NA
SVOCs	LCS %R	2,4,5-trichlorophenol phenol	%R = 50 %R = 44	All samples in SDG	TJ10017	UJ (all non-detects)
Metals	ICB/CCB	Beryllium	0.0007 mg/L	JP-M13-GWMW362 JP-M13-GWMW994 JP-M13-GWMW126R JP-M13-GWMW809 JP-M13-GWMW808	TJ10017	None - sample concentrations either non-detect or 5x greater than blank concentration

APPENDIX C2
TABLE 1

Summary of Qualified Results
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant
Will County, Illinois

Analysis	Failed Criteria	Compound	Result	Associated Samples	SDG	Flag
Metals	ICB/CCB	sodium	0.6700 mg/L	JP-M13-GWMW994 JP-M13-GWMW126R JP-M13-GWMW807 JP-M13-GWMW809 JP-M13-GWMW808 JP-M13-GWMW811	TJ10017	None - sample concentrations either non-detect or 5x greater than blank concentration
Metals	ICB/CCB	beryllium	0.0011 mg/L	JP-M13-GWMW807 JP-M13-GWMW811	TJ10017	None - sample concentrations either non-detect or 5x greater than blank concentration
Metals	MS/MSD %R	potassium sodium	%R = 119/- %R = 123/-	JP-M13-GWMW808	TJ10017	J (all detects)

Notes:
SDG = Sample delivery group.
HMX = High melting-point explosive.
%D = Percent difference.
%R = Percent recovery.
UJ = Not detected; estimated detection limit.
MS/MSD = Matrix spike/matrix spike duplicate.
J = Estimated concentration.
LCS = Laboratory control sample.
ICV = Initial calibration verification.
RPD = Relative percent difference.
SVOC = Semi-volatile organic compound.
VOC = Volatile organic compound.
ICB/CCB = Initial calibration blank/continuing calibration blank.
µg/L = Micrograms per liter.
mg/L = Milligrams per liter.
RDX = 1,3,5-Trinitro-1,3,5-triazinane.
NA = Not available.

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APPENDIX D

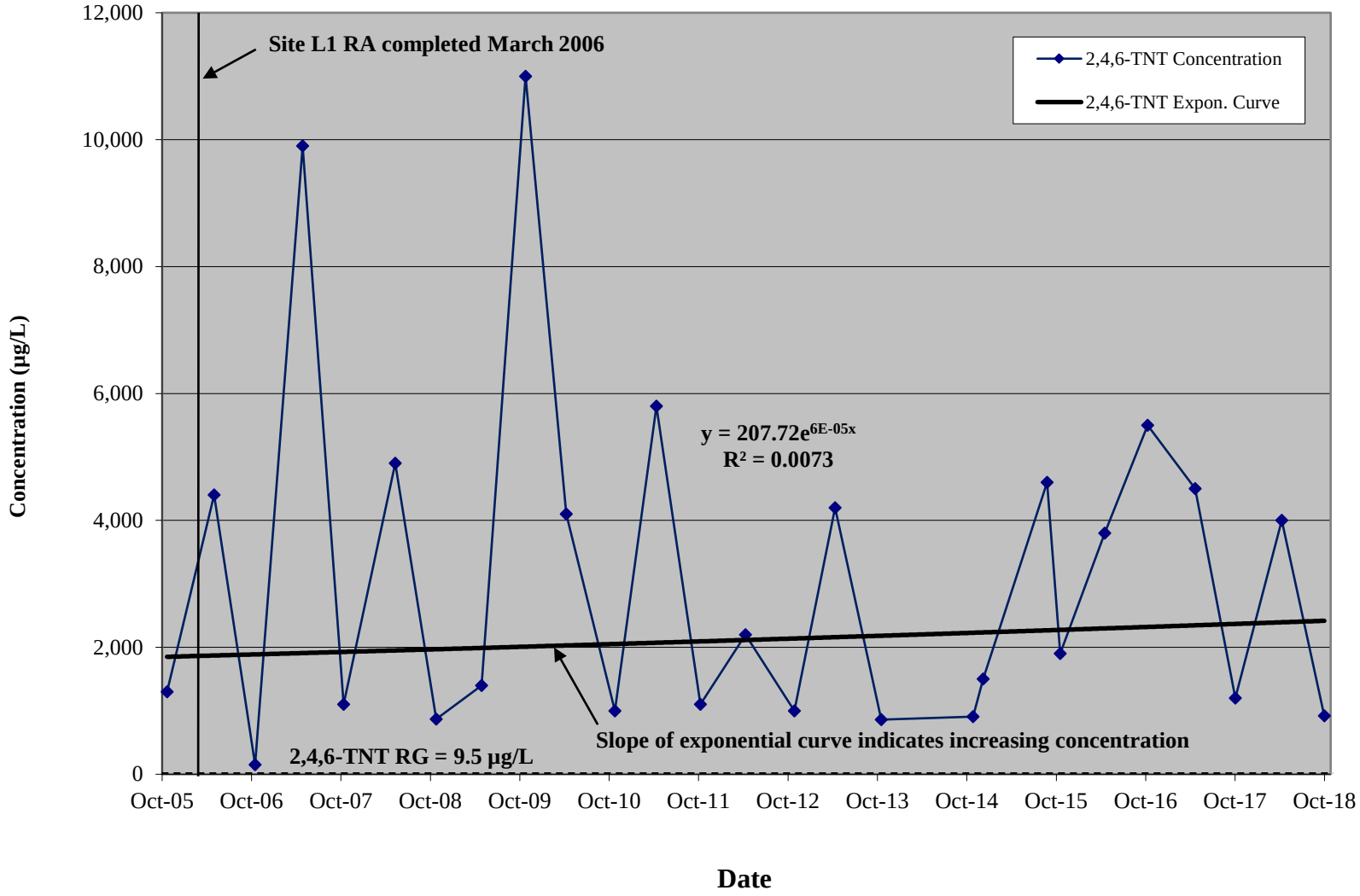
FIRST ORDER RATE DECAY TREND ANALYSIS

D1 – Trend Graphs
D2 – Estimated Clean-up Time: Example Calculation

D1 – TREND GRAPHS

FIGURE D-1

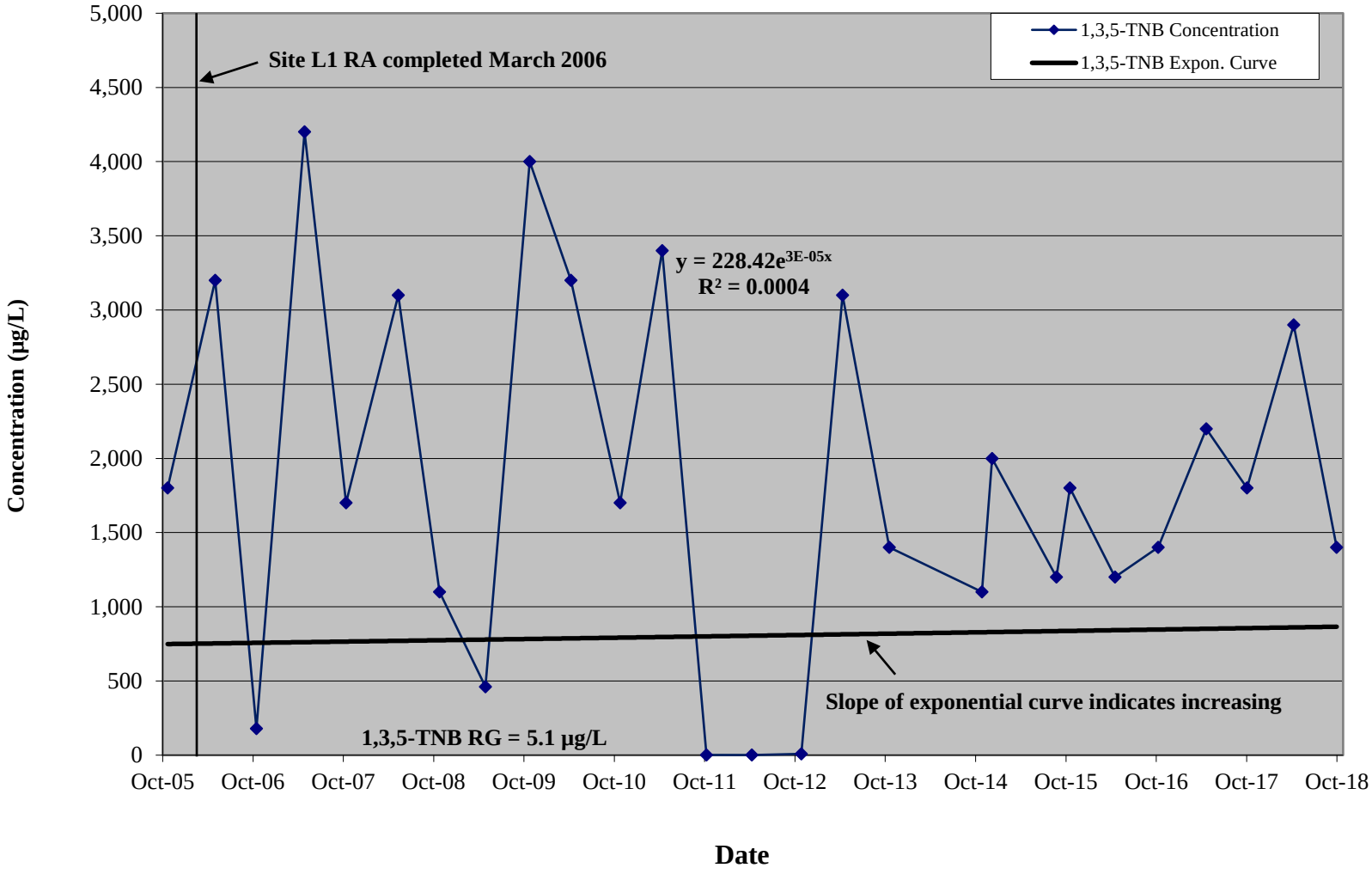
Site L1 - MW131
First Order Decay Rate Constant Estimation - 2,4,6-TNT
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant



RJR/rjr/SJA
J:\2028A USACE JOAAP\03.00 Deliverables\03.06 Reports 2018\03.06.03 Annual Report\03.06.03.03 FINAL Annual Report\Parts\Appendix D\D1-2_L1 MW131 Trend Analysis.xls(MW131 2,4,6-TNT)

FIGURE D-2

Site L1 - MW131
First Order Decay Rate Constant Estimation - 1,3,5-TNB
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant



RJR/rjr/SJA
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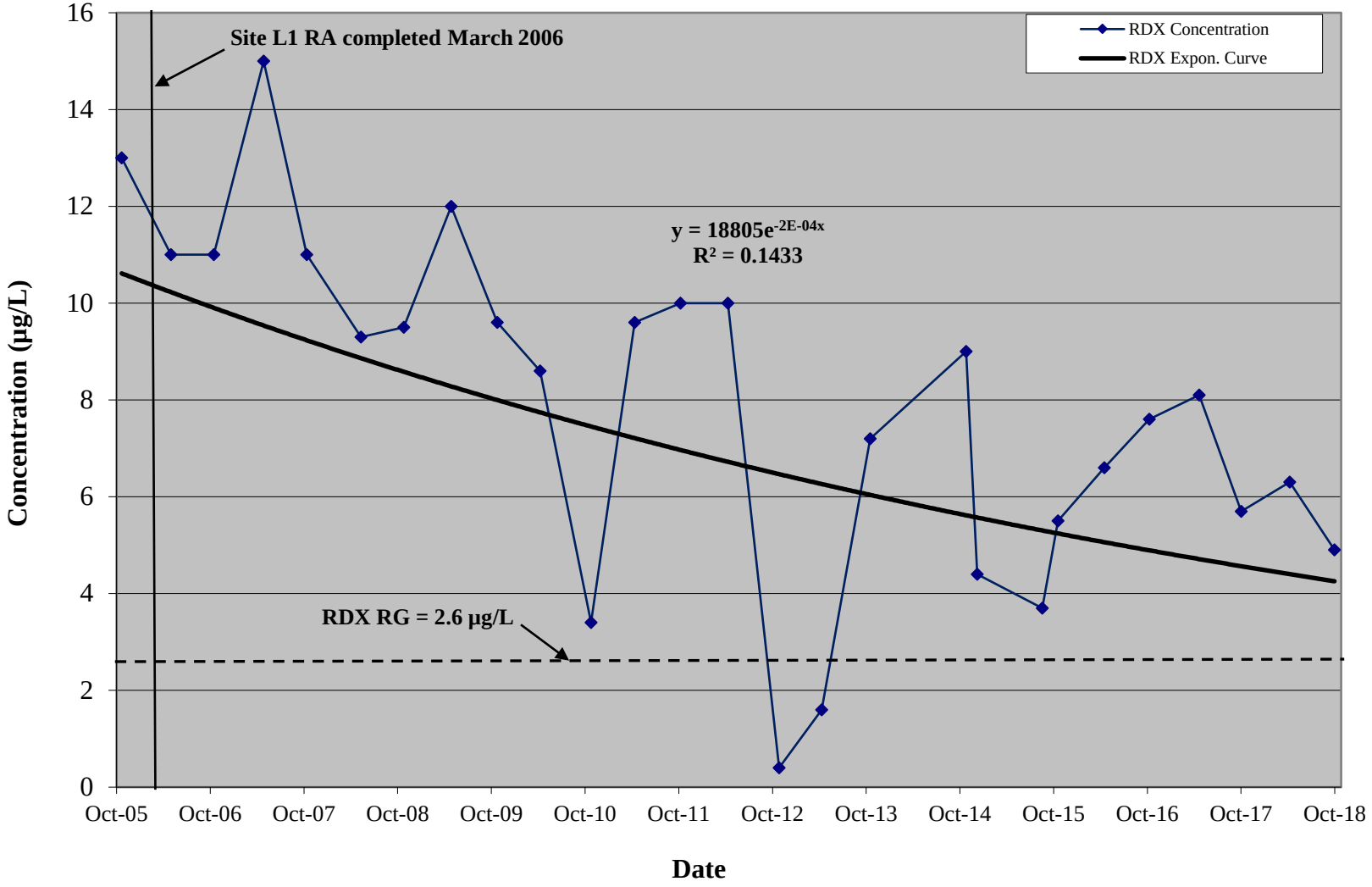
FIGURE D-3

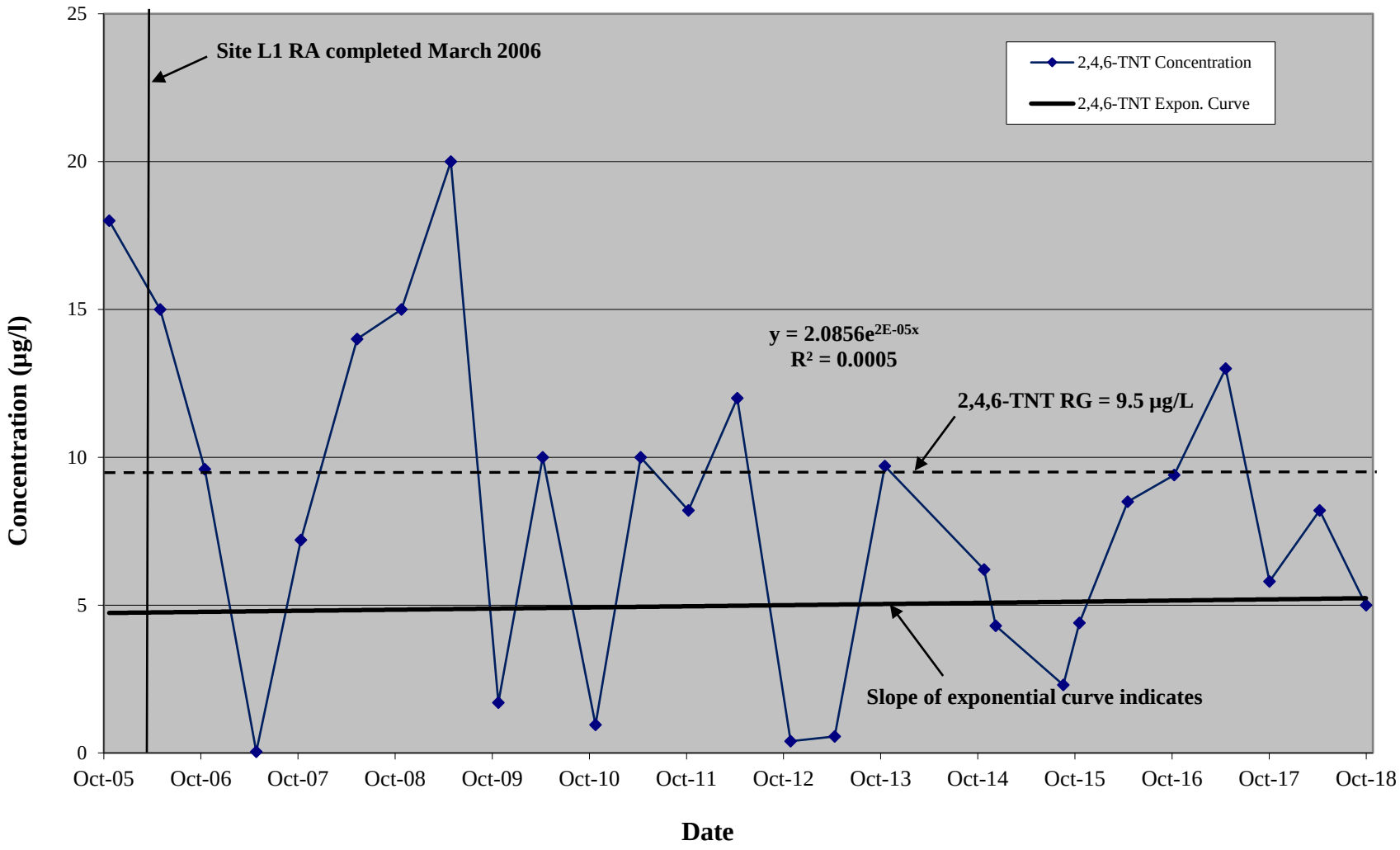
Site L1 - MW173
First Order Decay Rate Constant Estimation - RDX
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant



RJR/rjr/
J:\2028A USACE JOAAP\03.00 Deliverables\03.06 Reports 2018\03.06.03 Annual Report\03.06.03.03 FINAL Annual Report\Parts\Appendix D\D3-4_L1 MW173 Trend Analysis.xls(MW173 RDX)

FIGURE D-4

Site L1 - MW173
First Order Decay Rate Constant Estimation - 2,4,6-TNT
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant



RJR/rjr/
J:\2028A USACE JOAAP\03.00 Deliverables\03.06 Reports 2018\03.06.03 Annual Report\03.06.03.03 FINAL Annual Report\Parts\Appendix D\D3-4_L1 MW173 Trend Analysis.xls(MW173 2,4,6-TNT)

FIGURE D-5

Site L2 - MW404
First Order Decay Rate Constant Estimation - RDX
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant

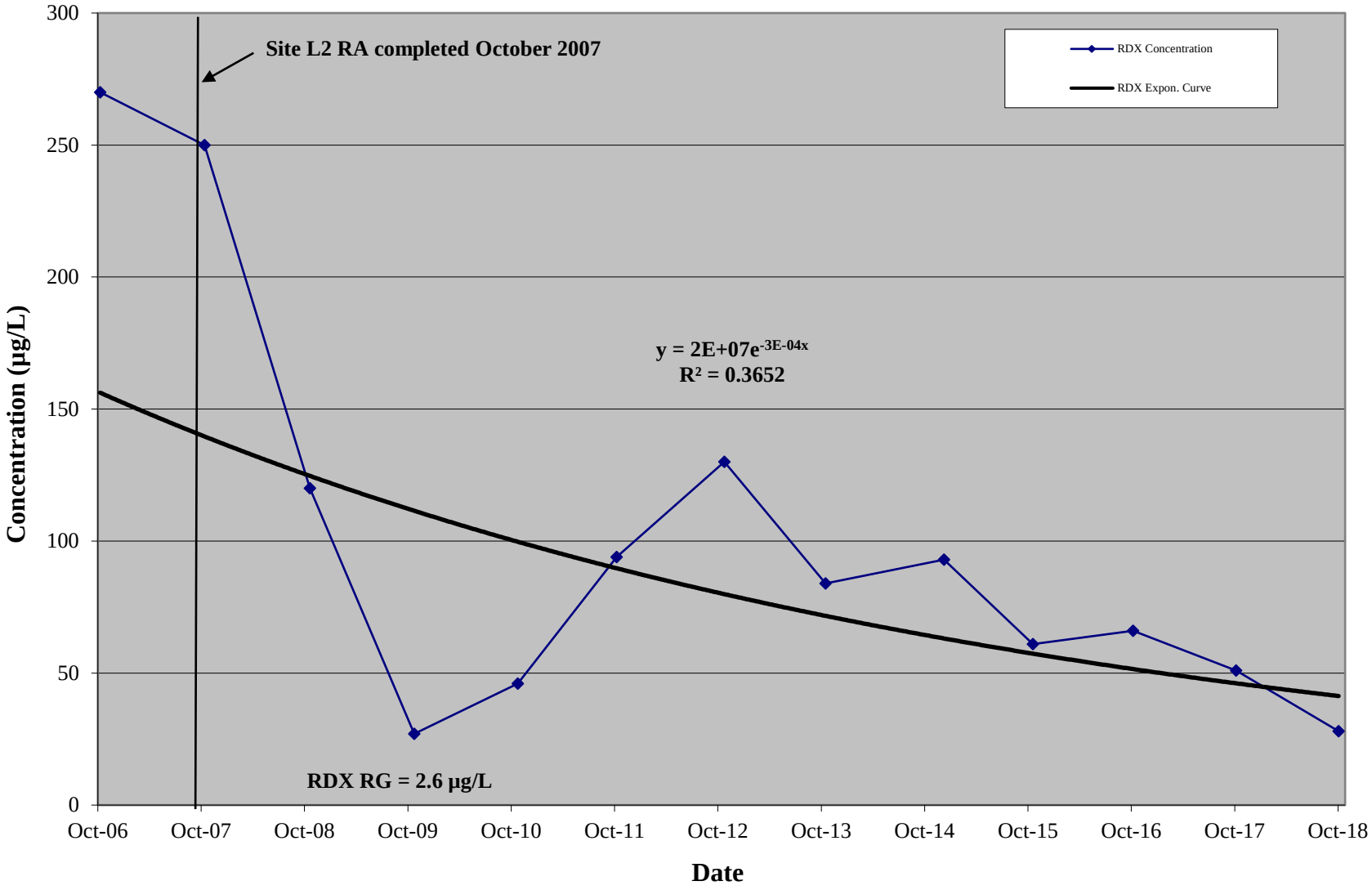


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FIGURE D-6

Site L3 - MW412
First Order Decay Rate Constant Estimation - RDX
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant

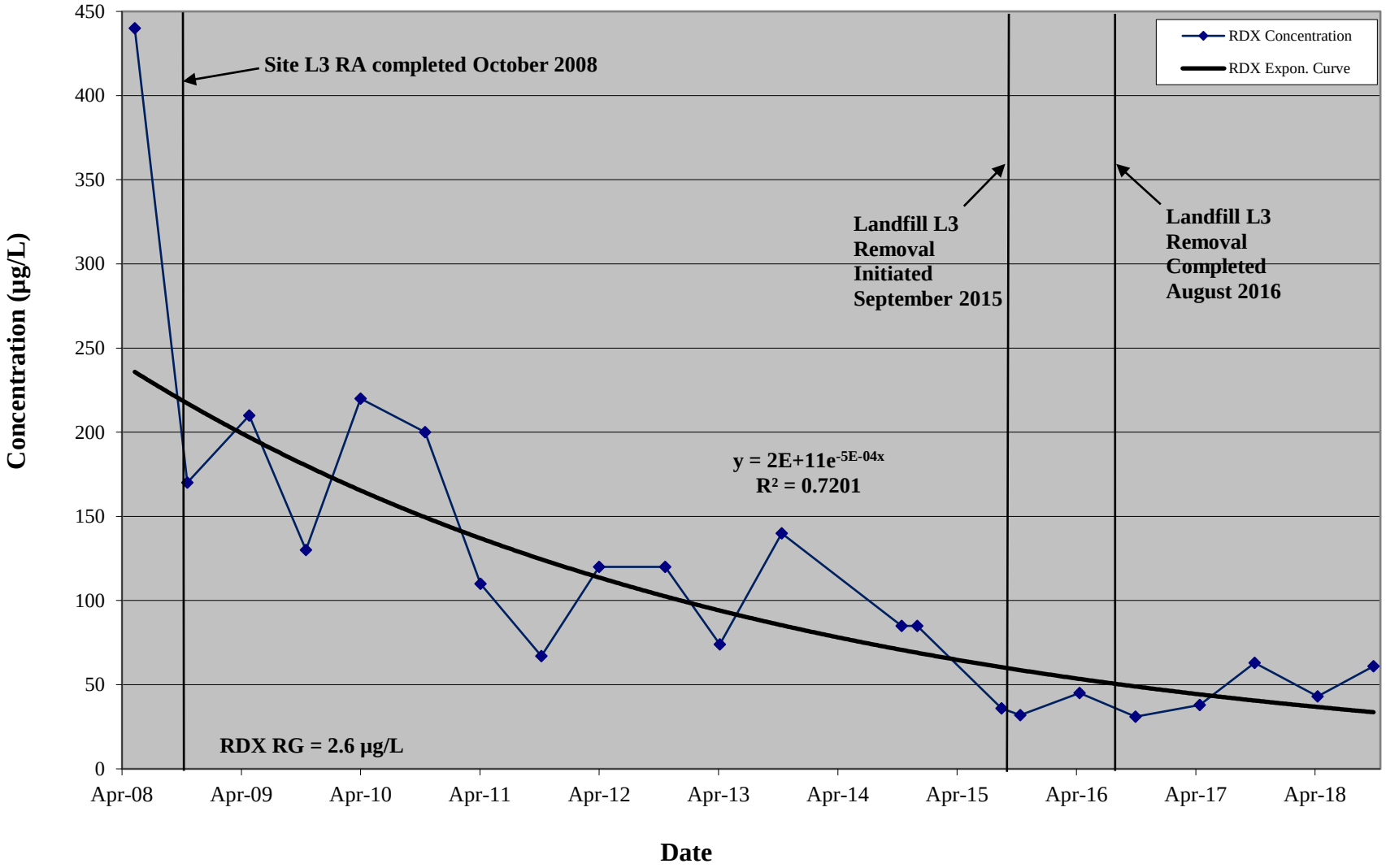

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FIGURE D-7

Site L3 - MW630
First Order Decay Rate Constant Estimation - RDX
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant

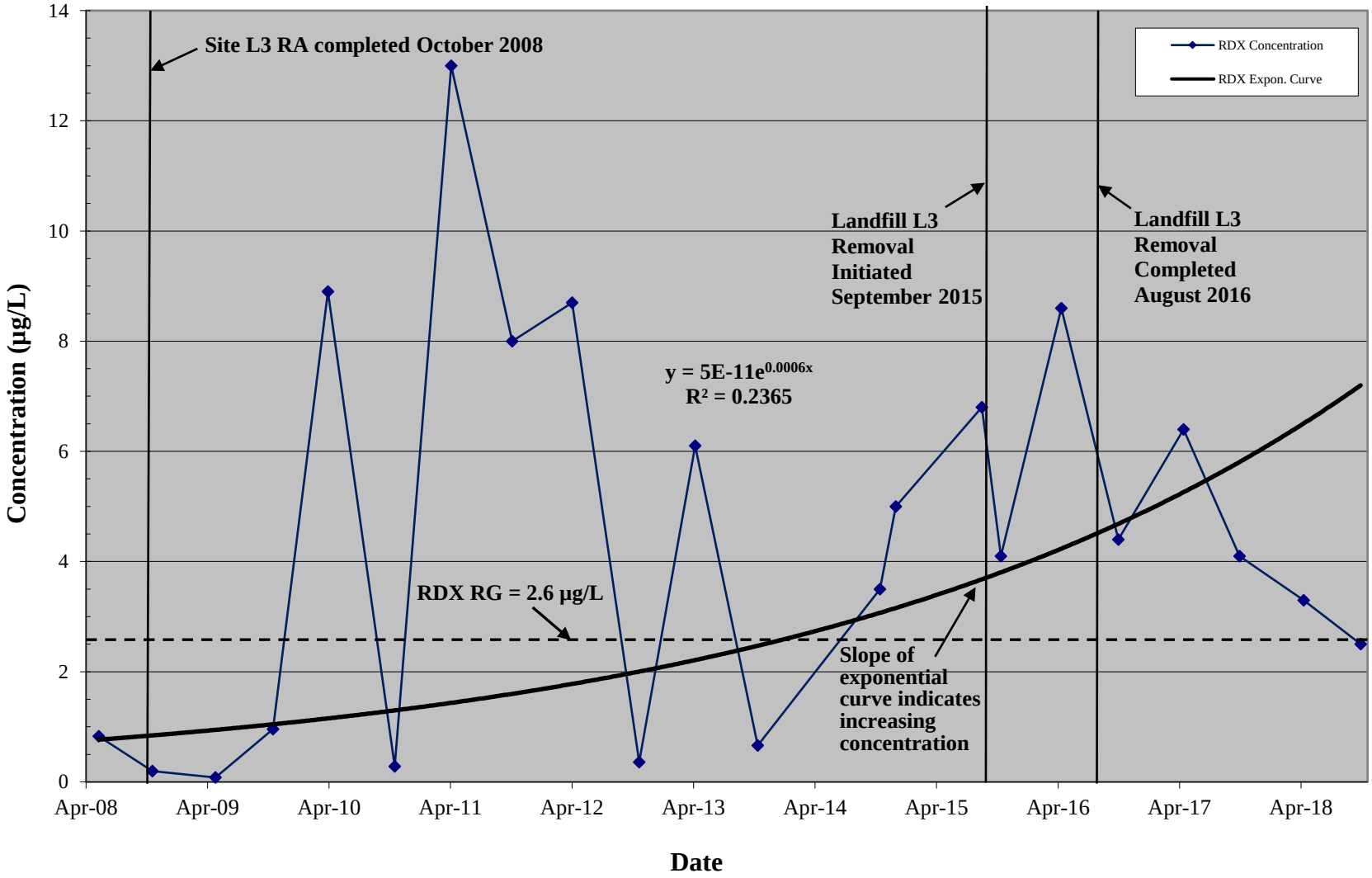

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FIGURE D-8

Site L3 - MW633
First Order Decay Rate Constant Estimation - RDX
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant

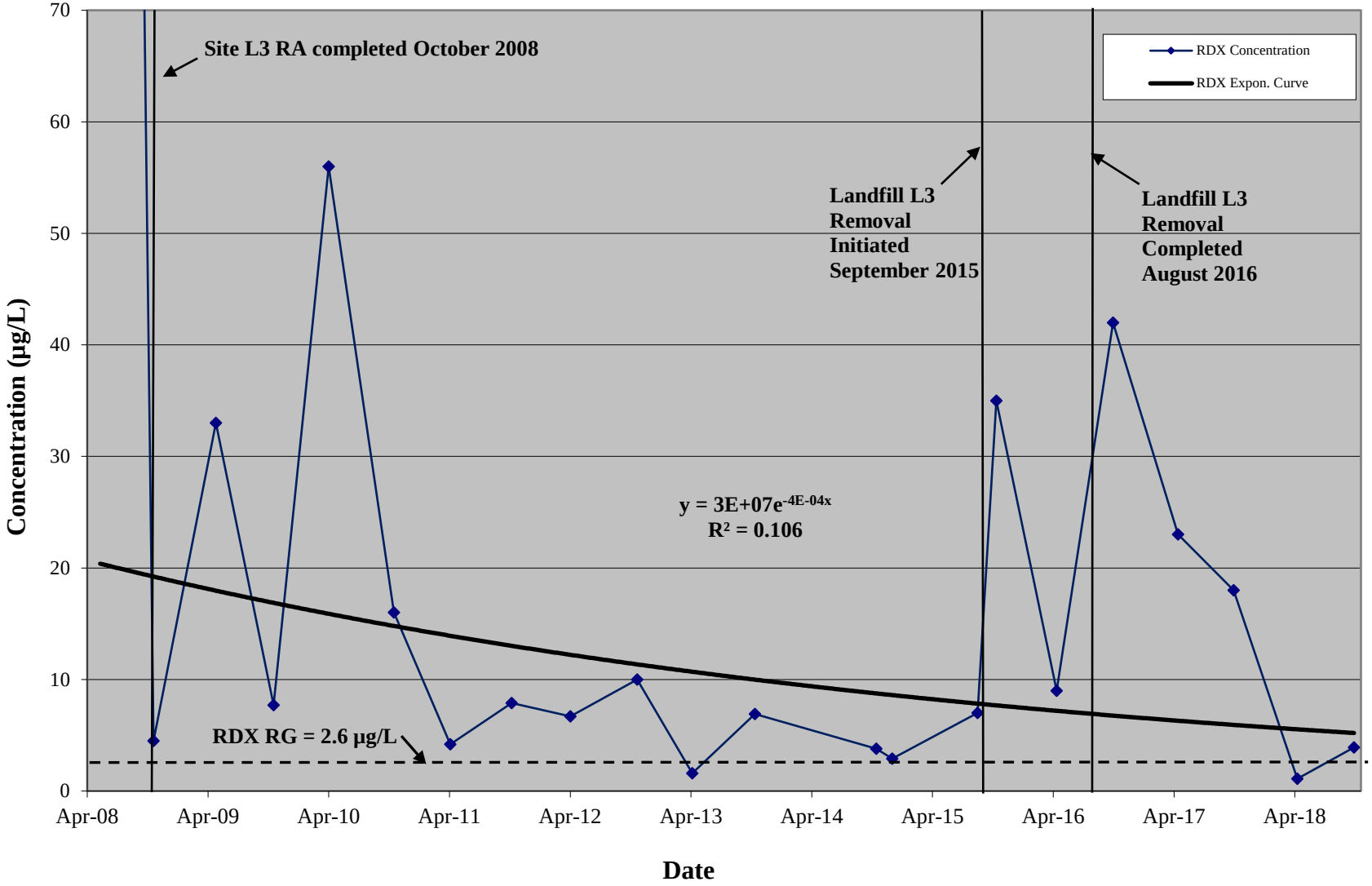

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FIGURE D-9

Site L14 - MW511
First Order Decay Rate Constant Estimation - RDX
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant

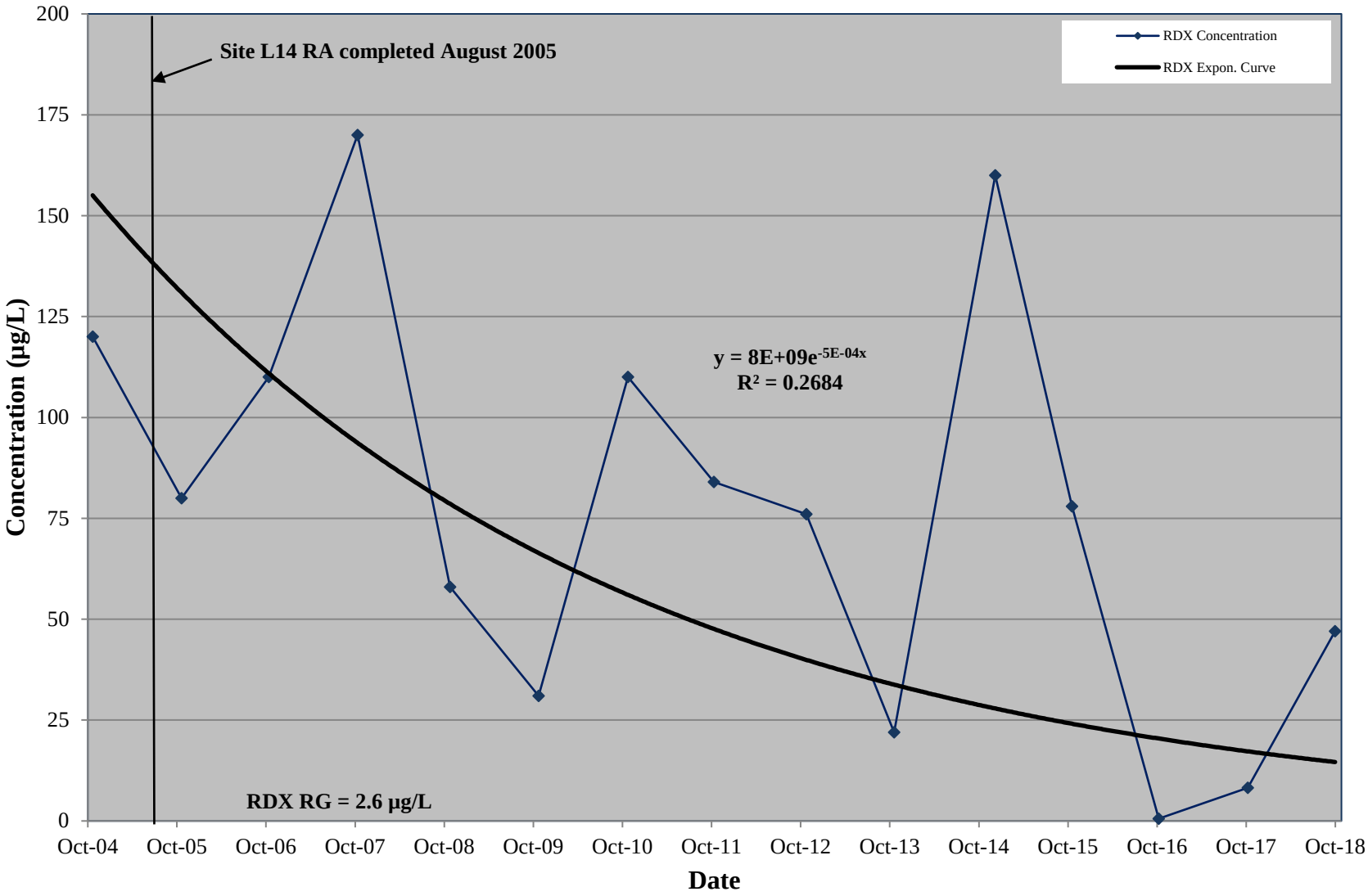

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FIGURE D-10

Site L14 - MW512
First Order Decay Rate Constant Estimation - RDX
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant

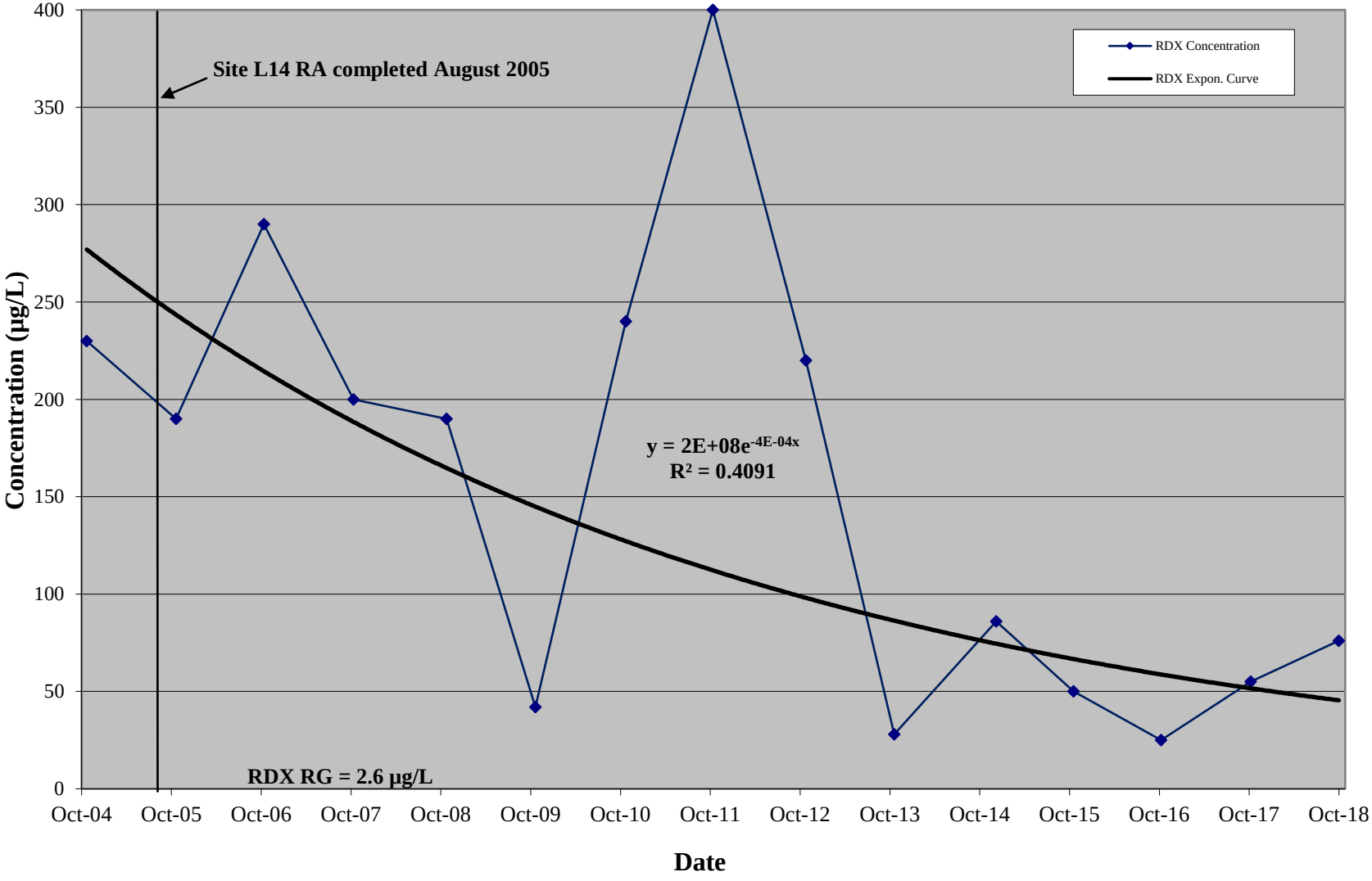

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FIGURE D-11

Site M1 - MW107
First Order Decay Rate Constant Estimation - Sulfate
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant

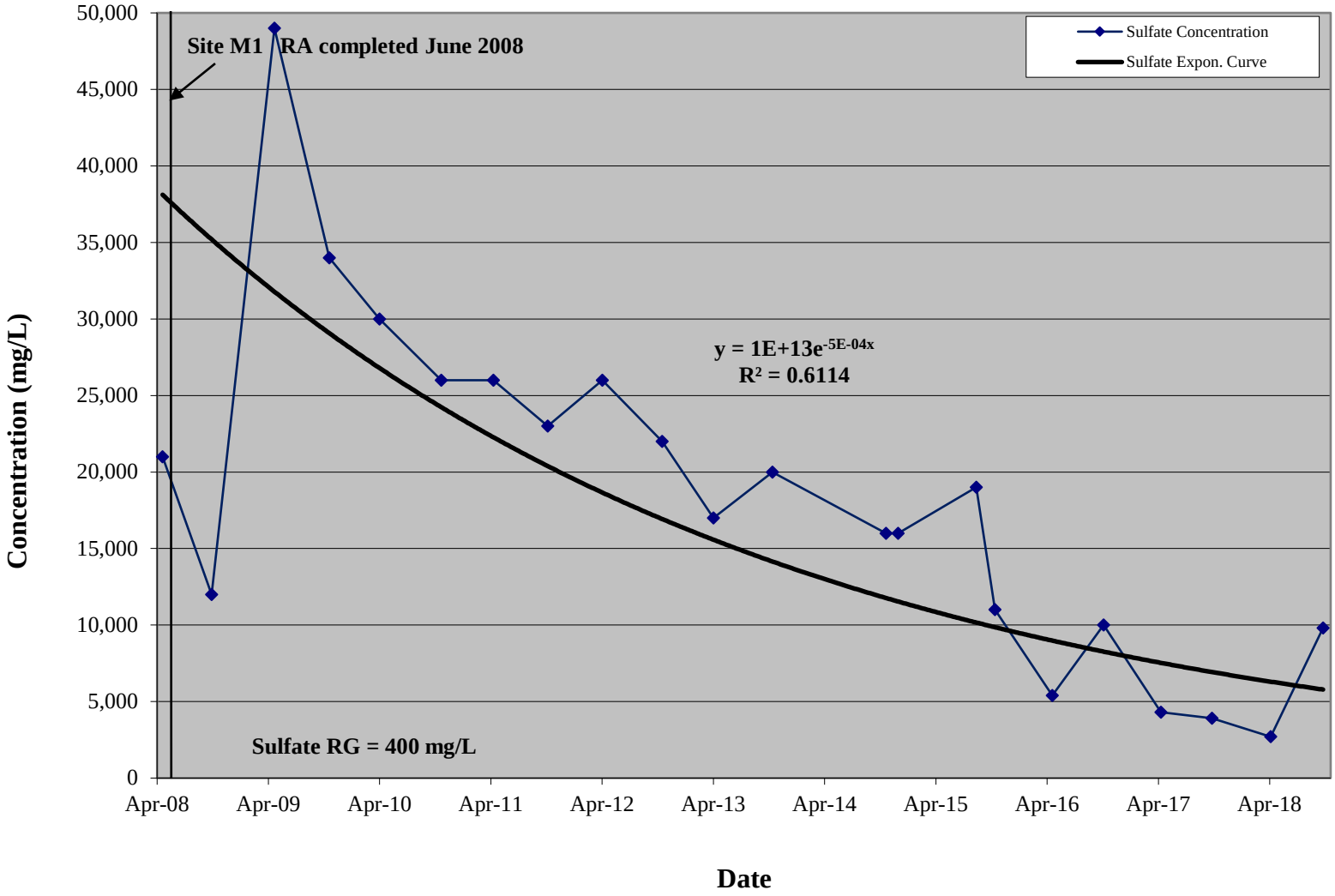

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FIGURE D-12

Site M1 - MW231
First Order Decay Rate Constant Estimation - Sulfate
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant

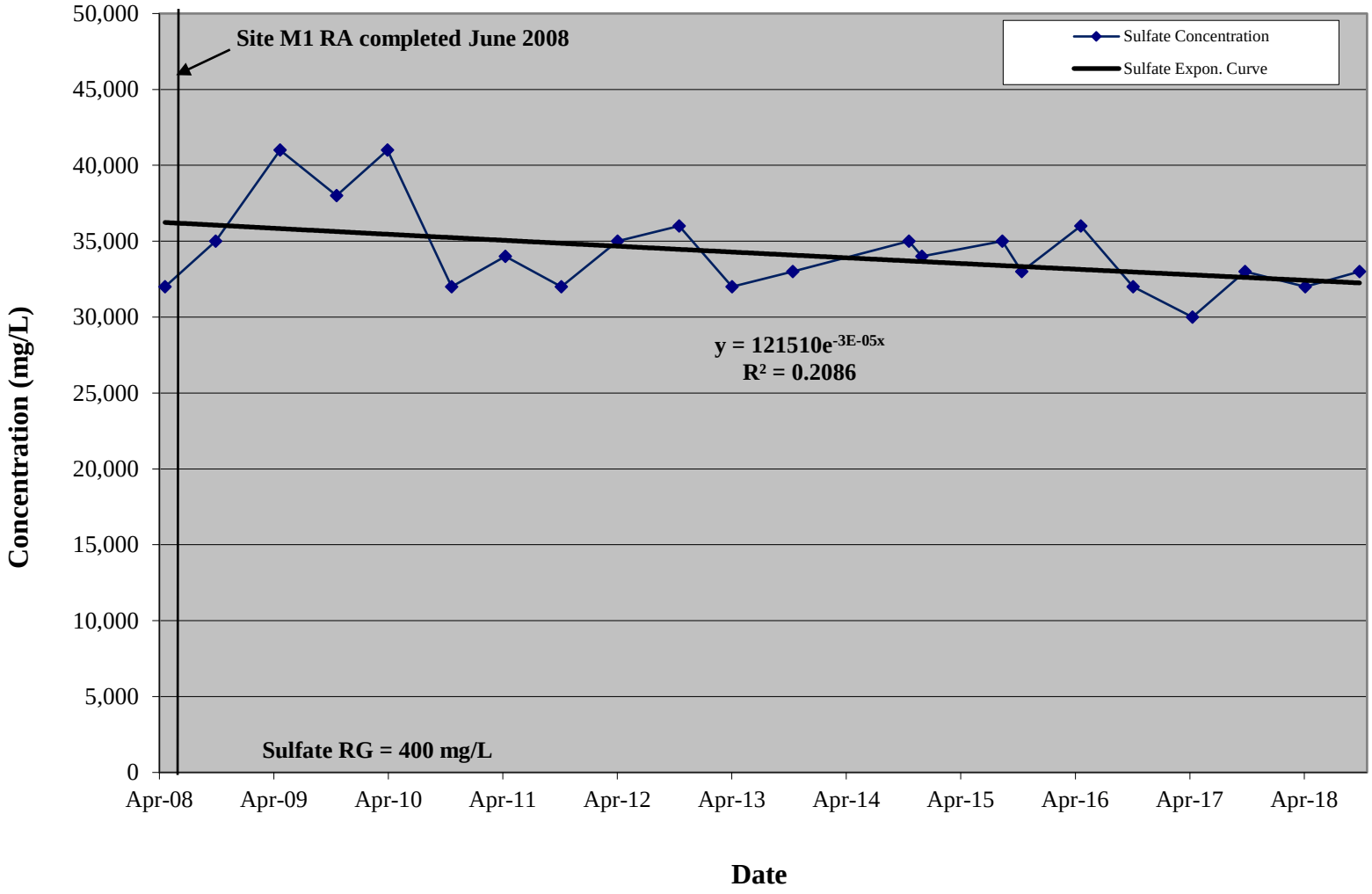

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FIGURE D-13

Site M1 - MW640
First Order Decay Rate Constant Estimation - Sulfate
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant

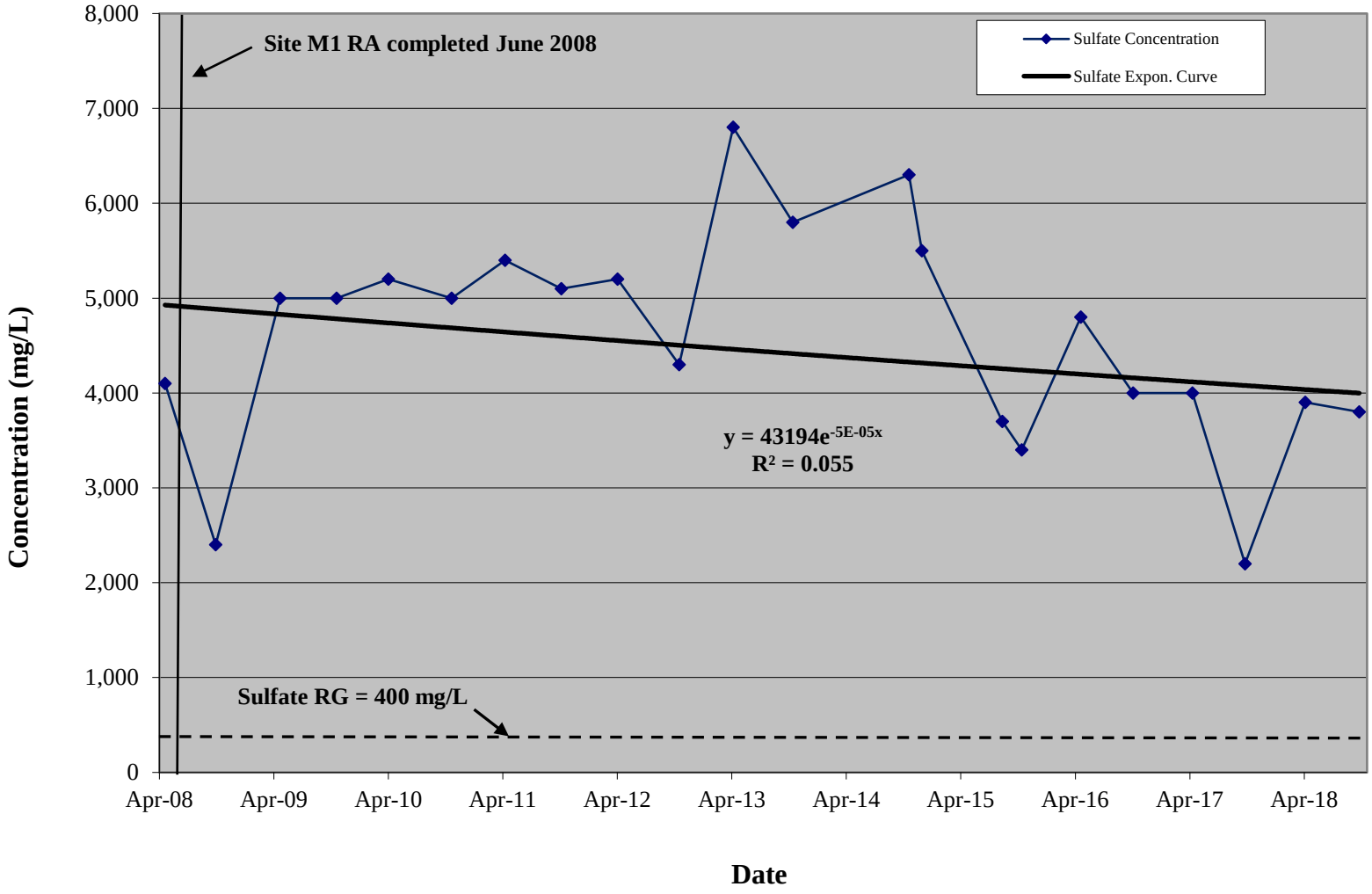

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FIGURE D-14

Site M1 - MW641
First Order Decay Rate Constant Estimation - Sulfate
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant

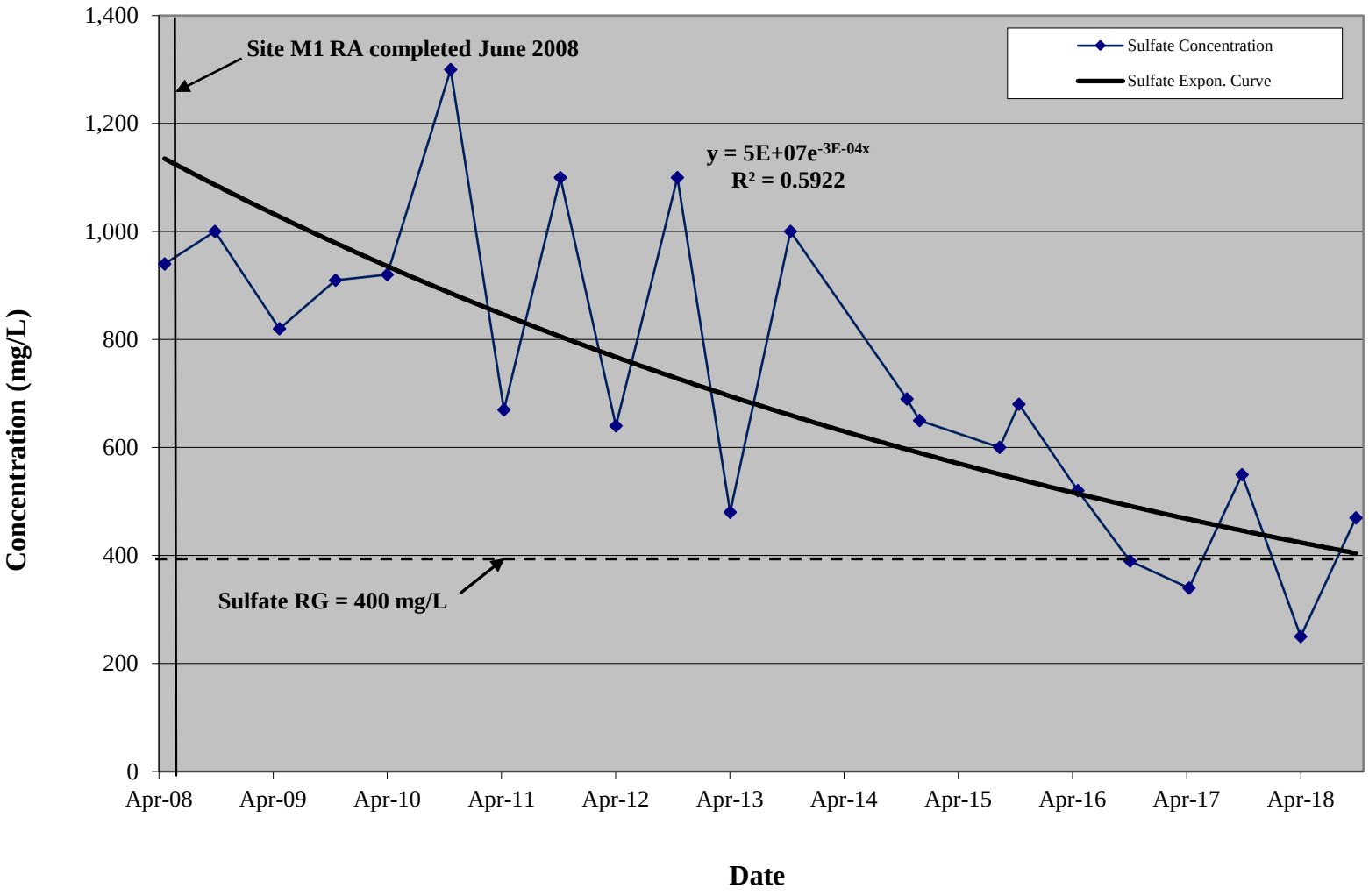

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FIGURE D-15

Site M1 - MW642
First Order Decay Rate Constant Estimation - Sulfate
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant

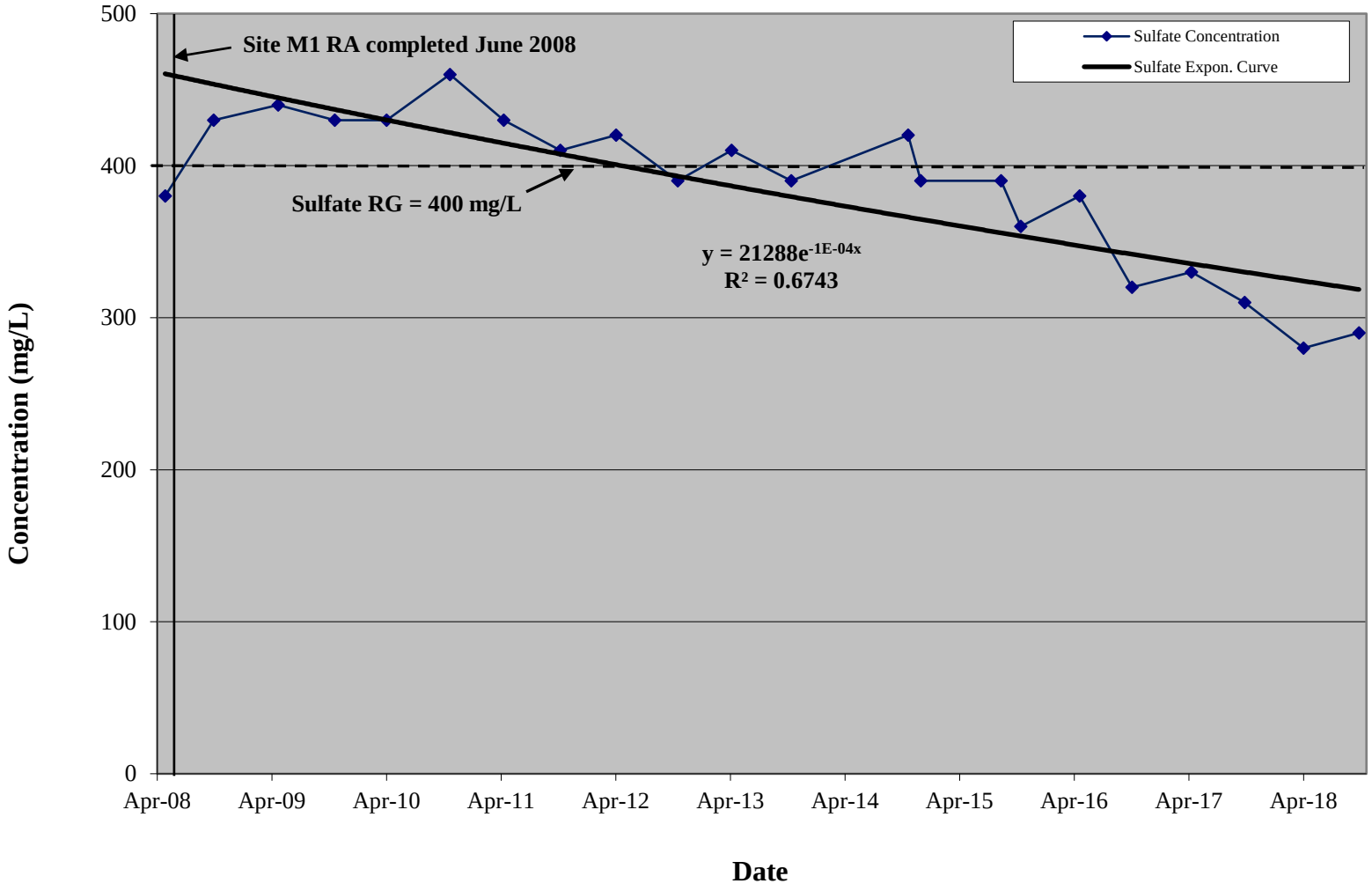

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FIGURE D-16

Site M6 - MW212R
First Order Decay Rate Constant Estimation - 2,4-DNT
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant

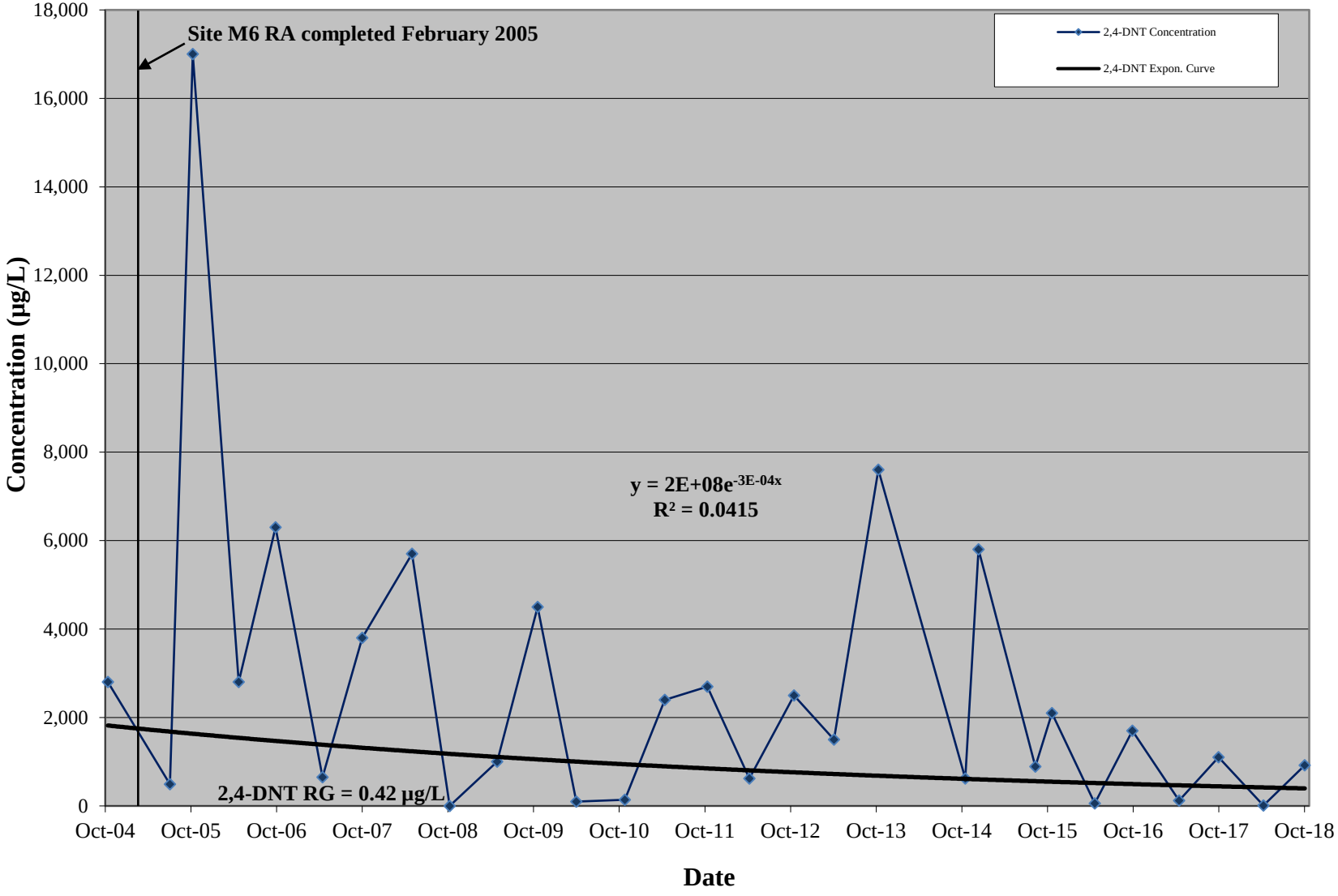

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FIGURE D-17

Site M6 - MW212R
First Order Decay Rate Constant Estimation - 2,6-DNT
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant

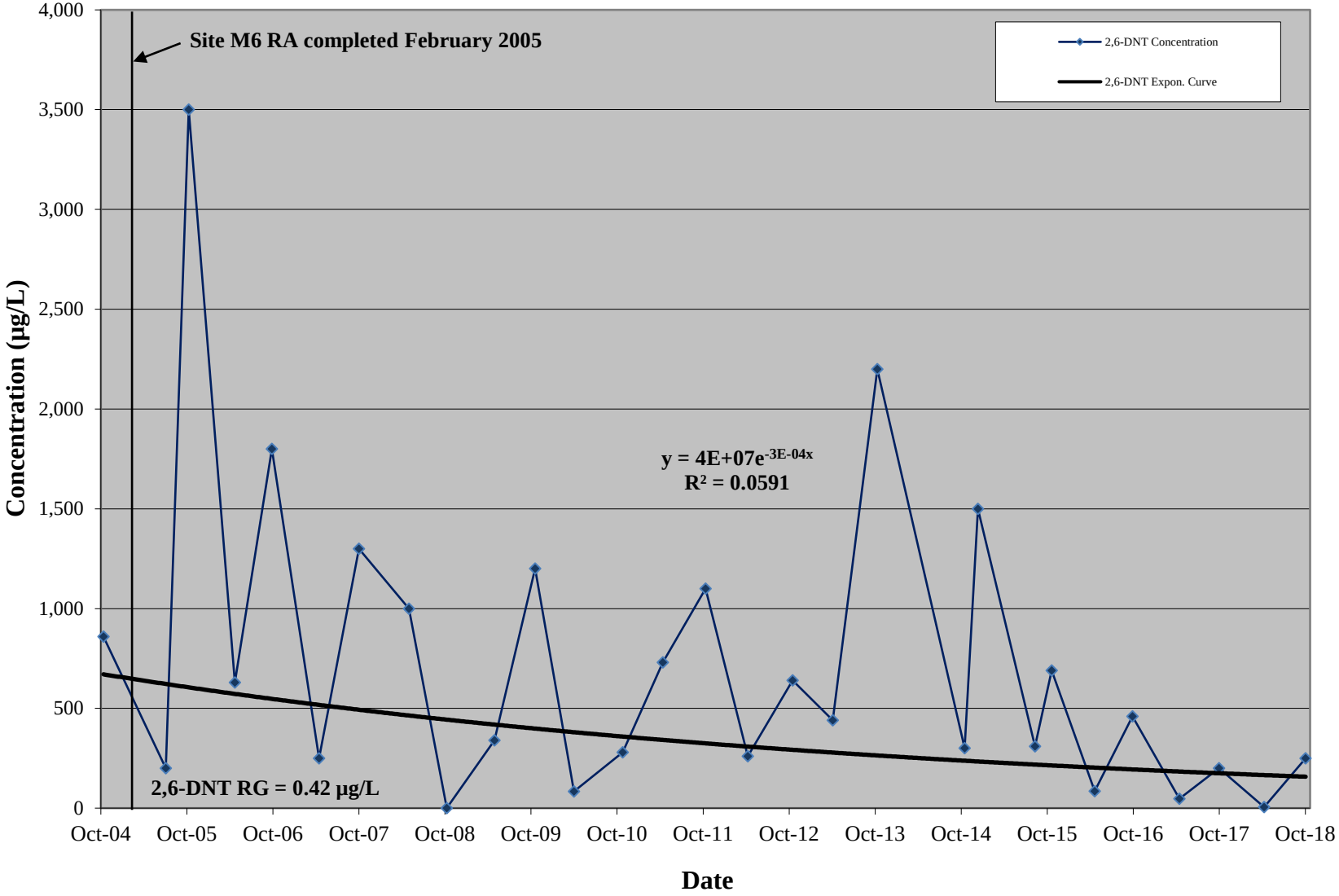

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FIGURE D-18

Site M6 - MW212R
First Order Decay Rate Constant Estimation - 2-NT
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant

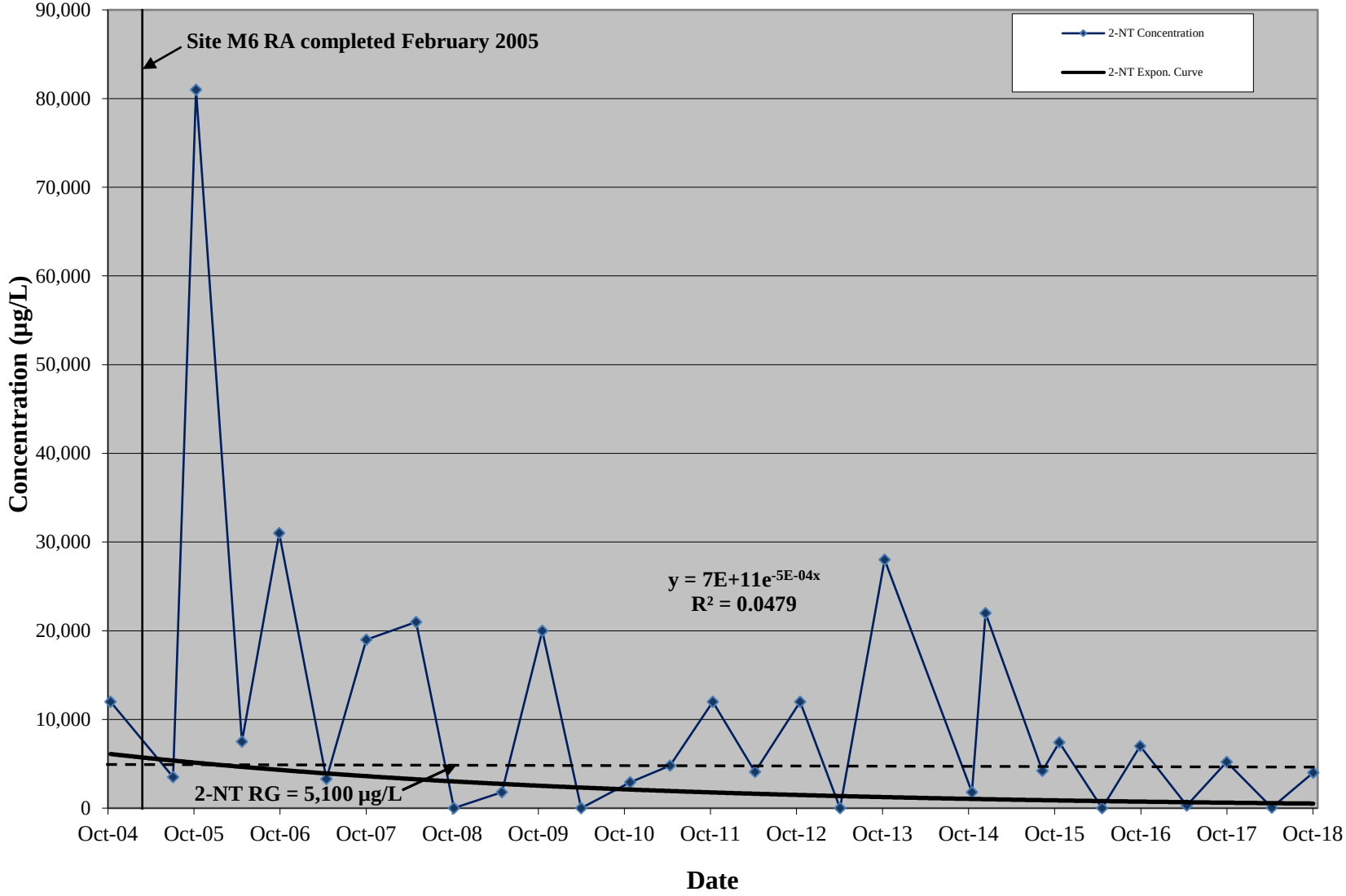

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FIGURE D-19

Site M6 - MW212R
First Order Decay Rate Constant Estimation - 2,4,6-TNT
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant

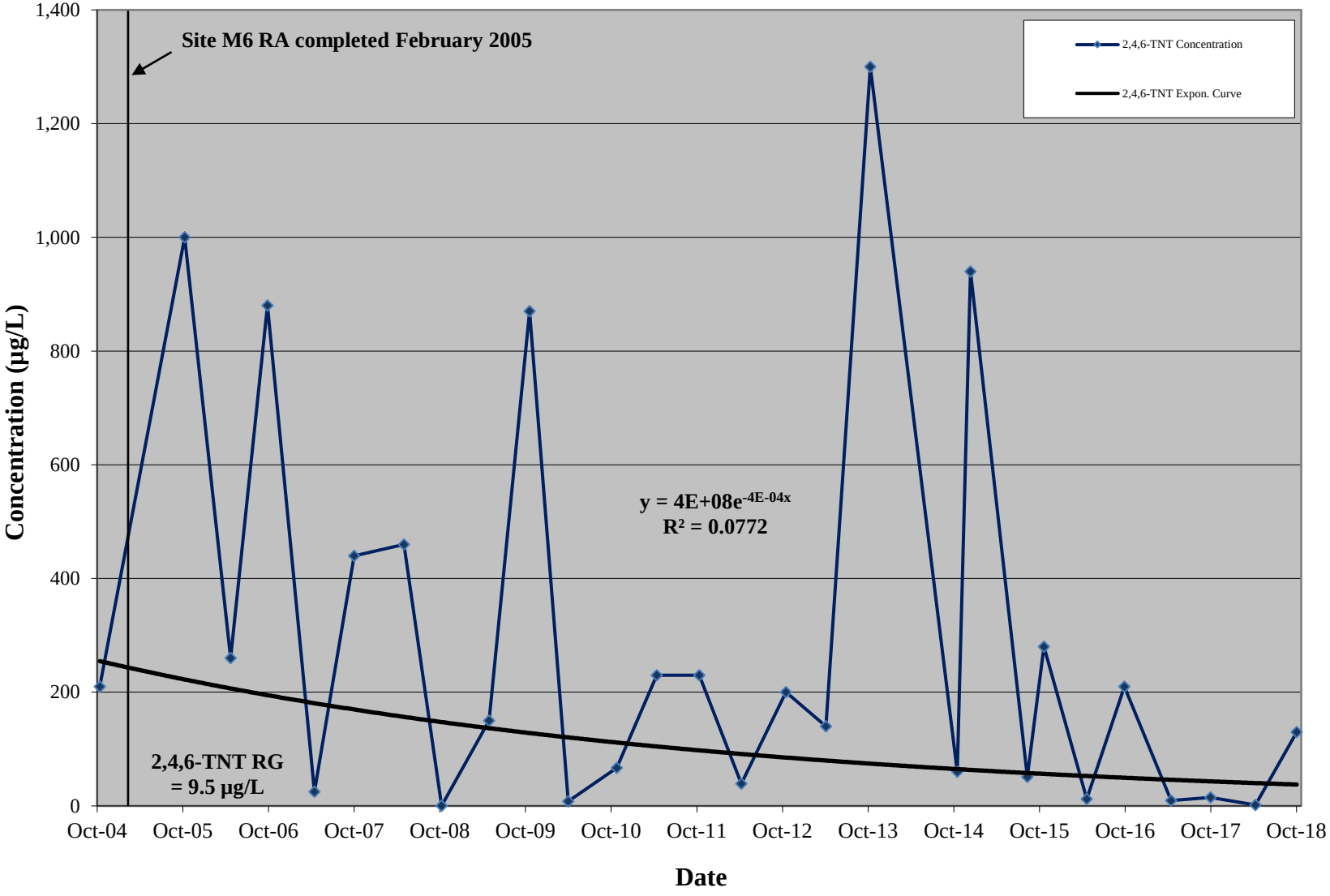

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FIGURE D-20

Site M6 - MW652
First Order Decay Rate Constant Estimation - 2,4-DNT
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant

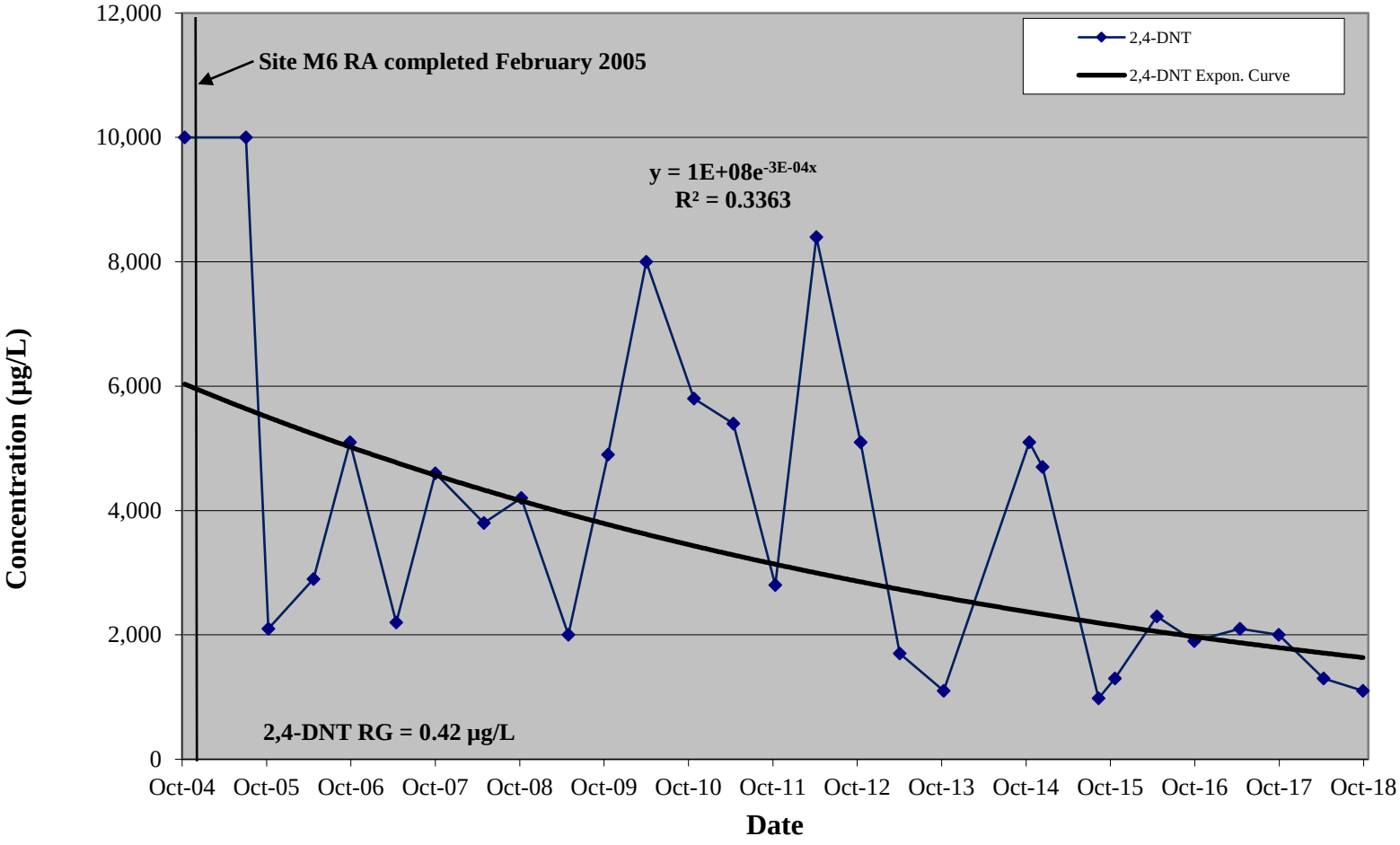

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FIGURE D-21

Site M6 - MW652
First Order Decay Rate Constant Estimation - 2,6-DNT
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant

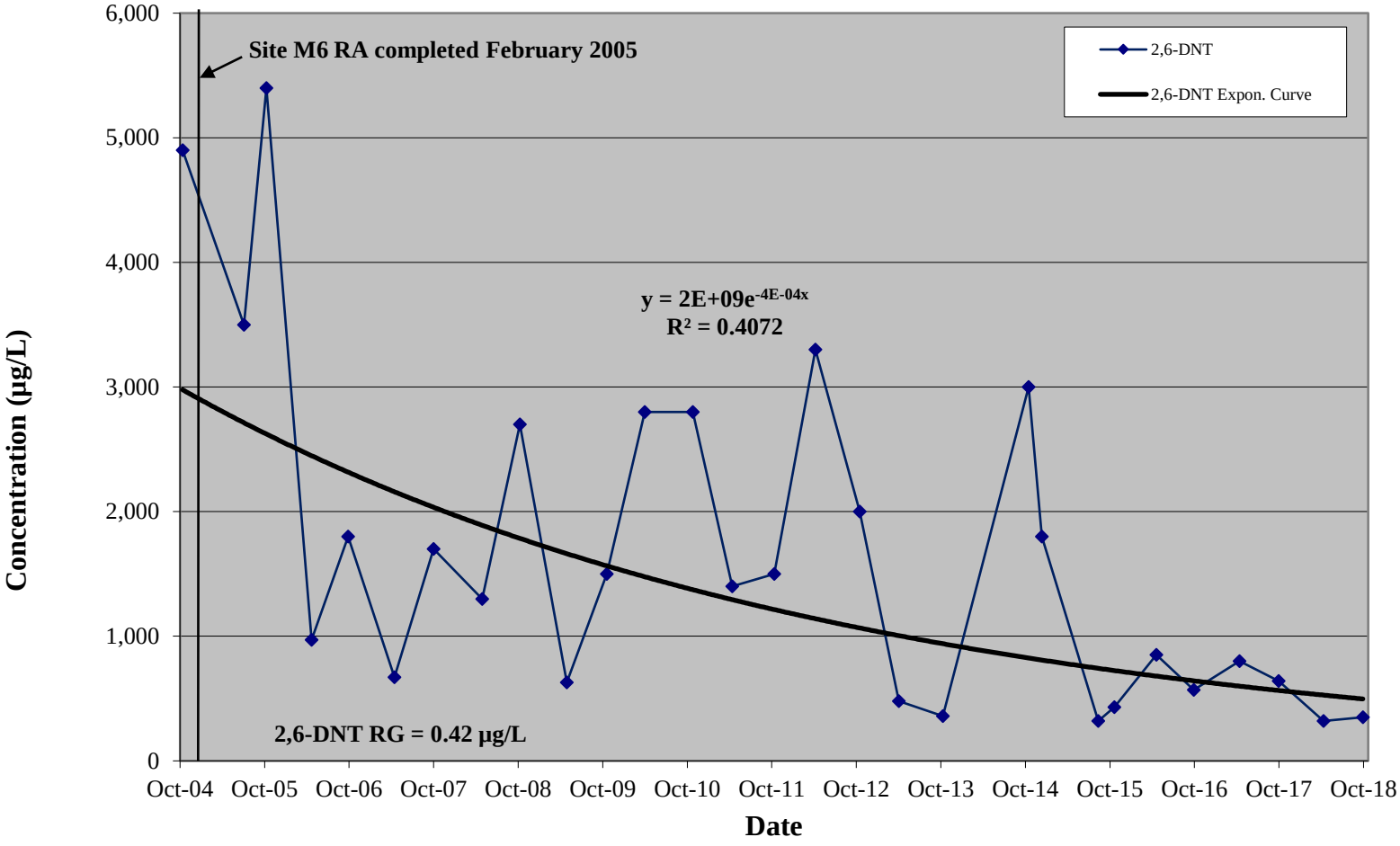

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FIGURE D-22

Site M6 - MW652
First Order Decay Rate Constant Estimation - 2-NT
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant

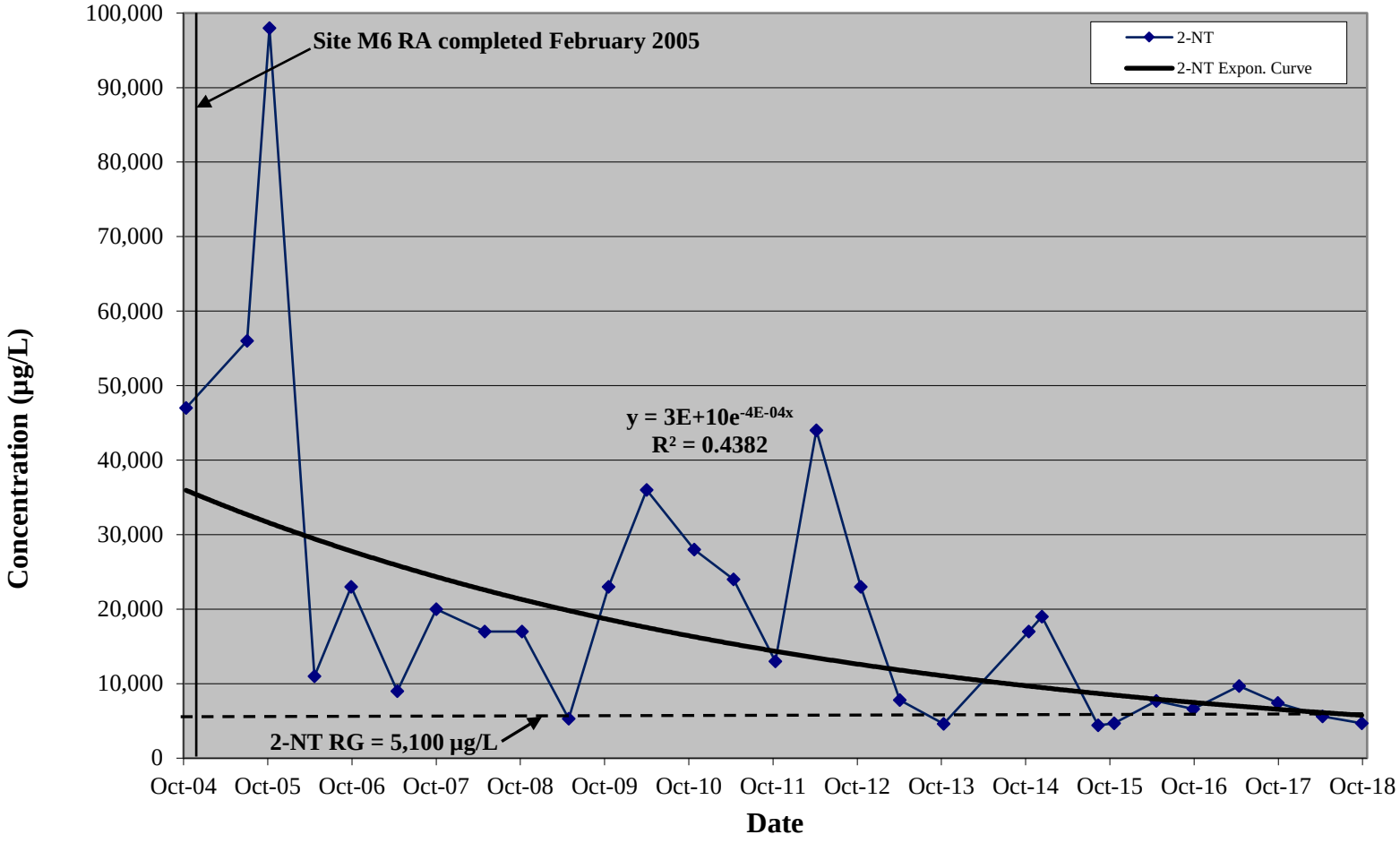

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FIGURE D-23

Site M6 - MW652
First Order Decay Rate Constant Estimation - 2,4,6-TNT
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant

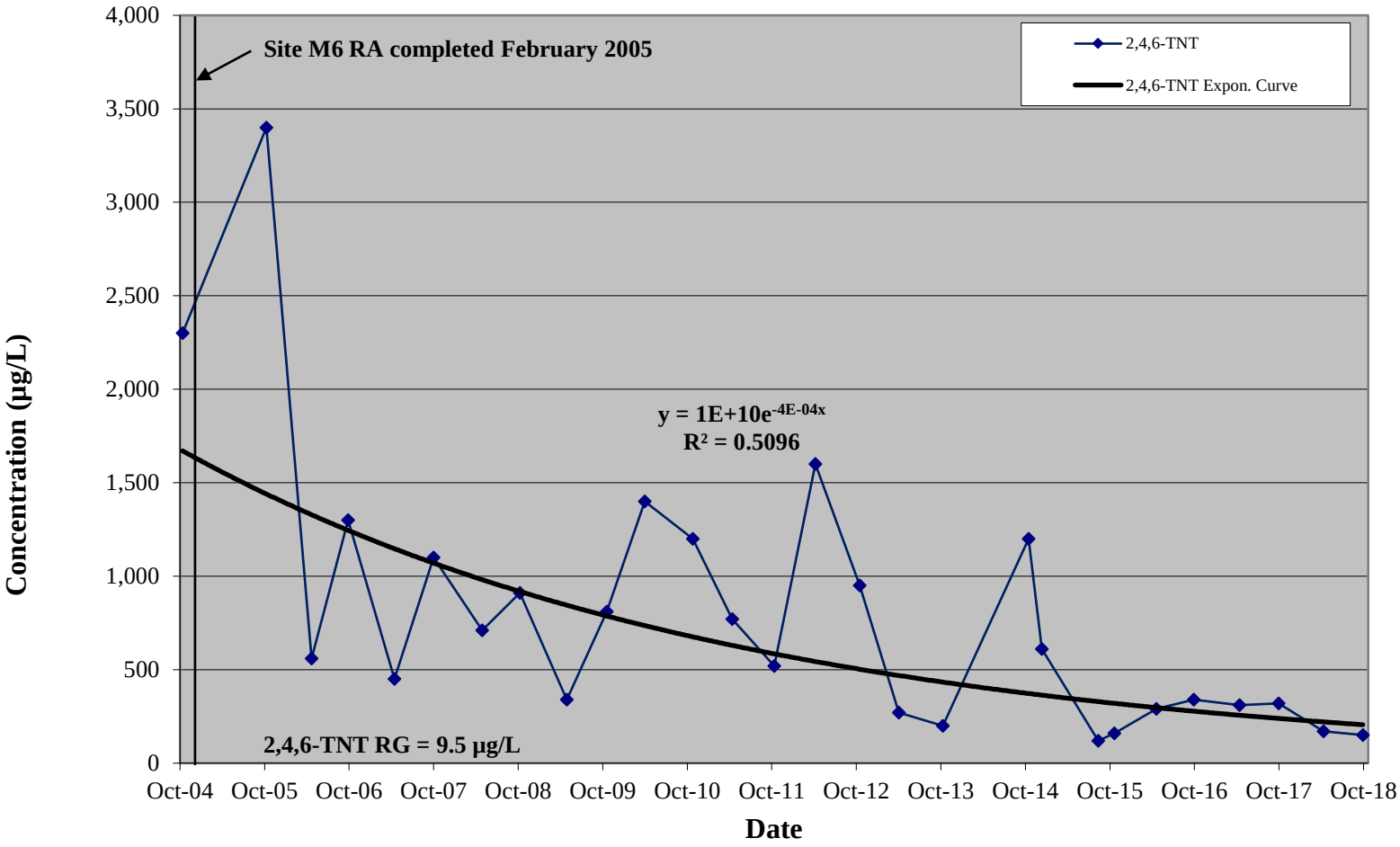

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FIGURE D-24

Site M8 - MW330
First Order Decay Rate Constant Estimation - Sulfate
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant

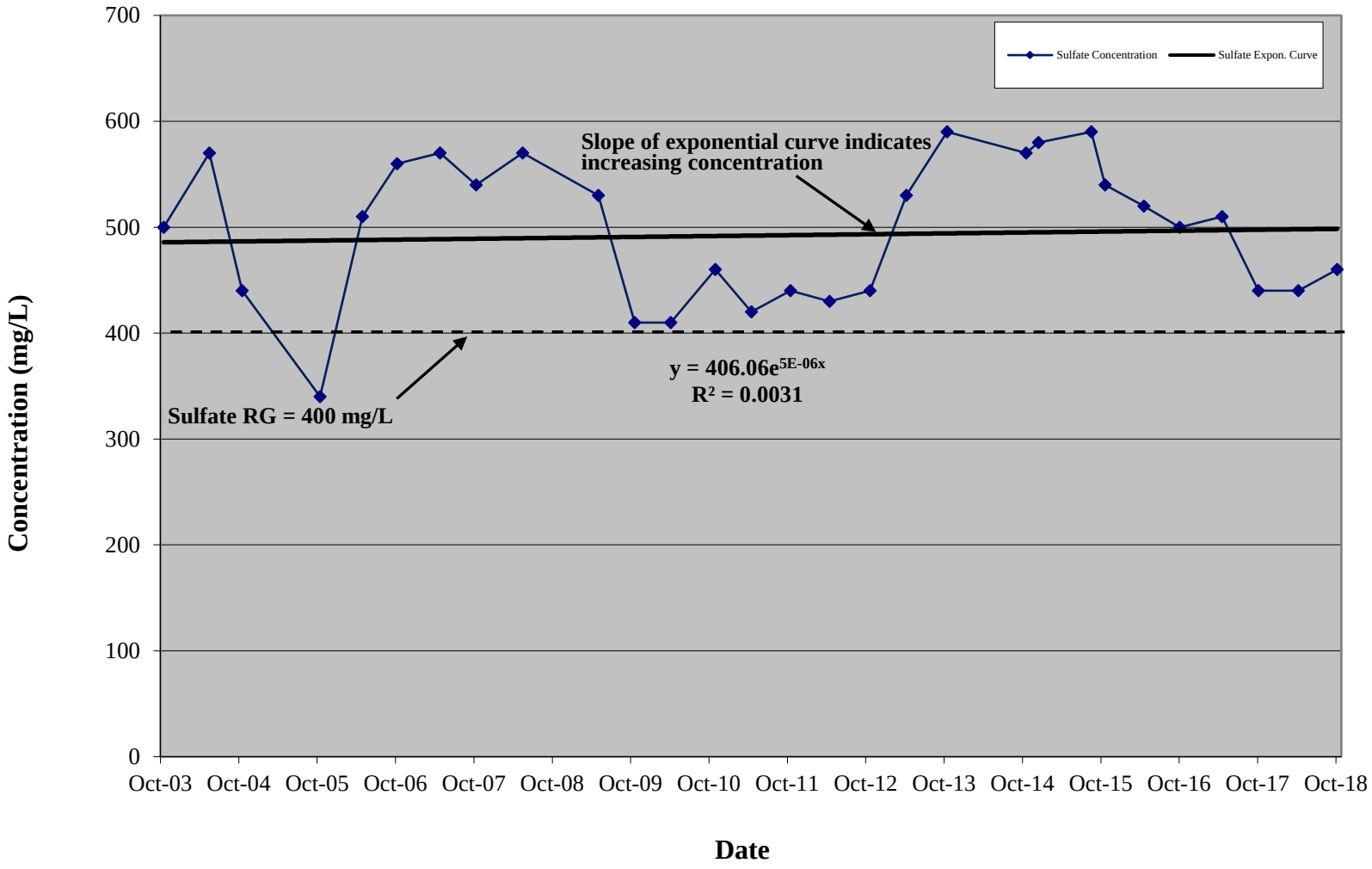

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FIGURE D-25

Site M6 - MW318
First Order Decay Rate Constant Estimation - 2,6-DNT
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant

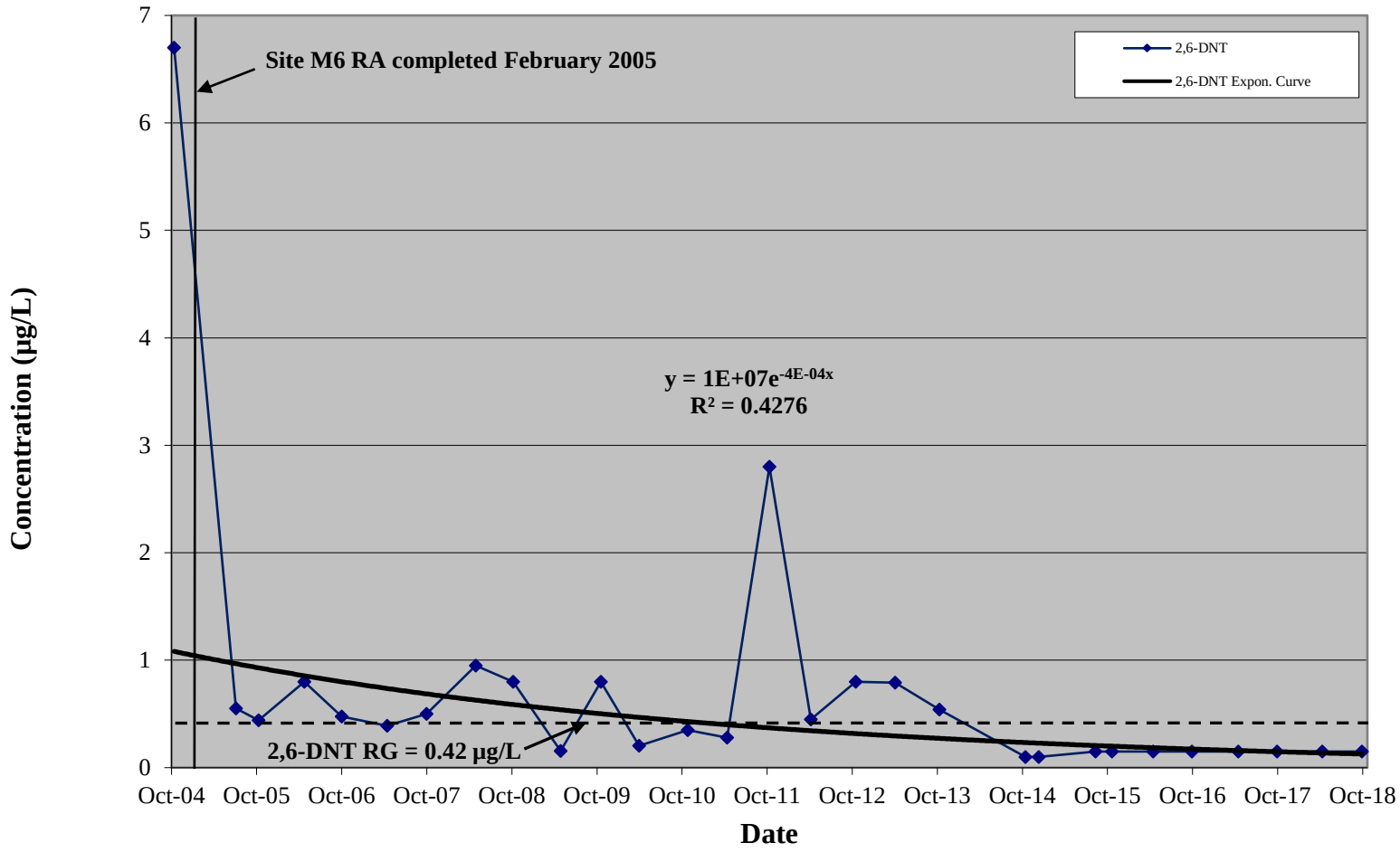

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FIGURE D-26

Site M6 - MW654
First Order Decay Rate Constant Estimation - 2,4-DNT
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant

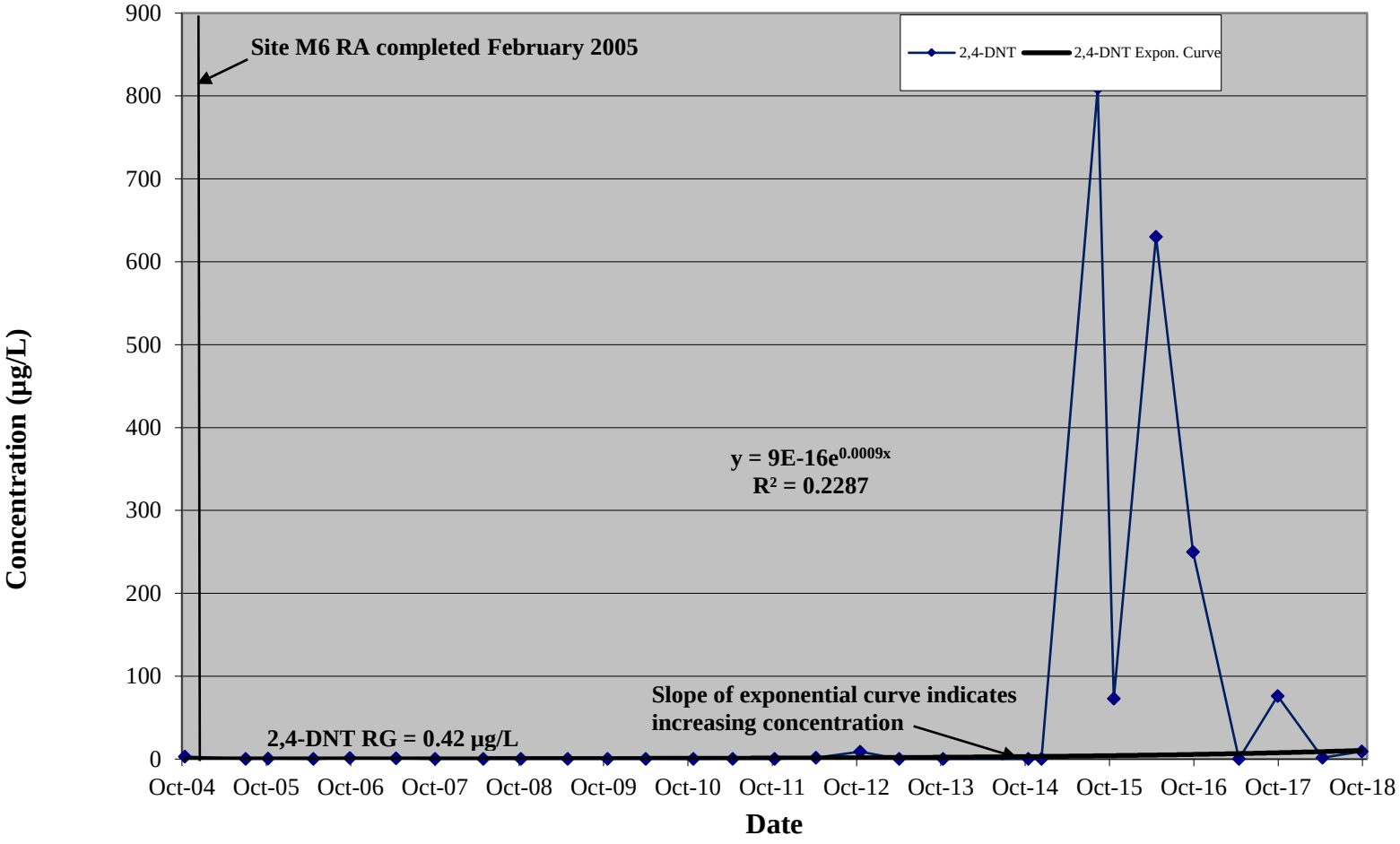

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FIGURE D-27

Site M6 - MW654
First Order Decay Rate Constant Estimation - 2,6-DNT
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant

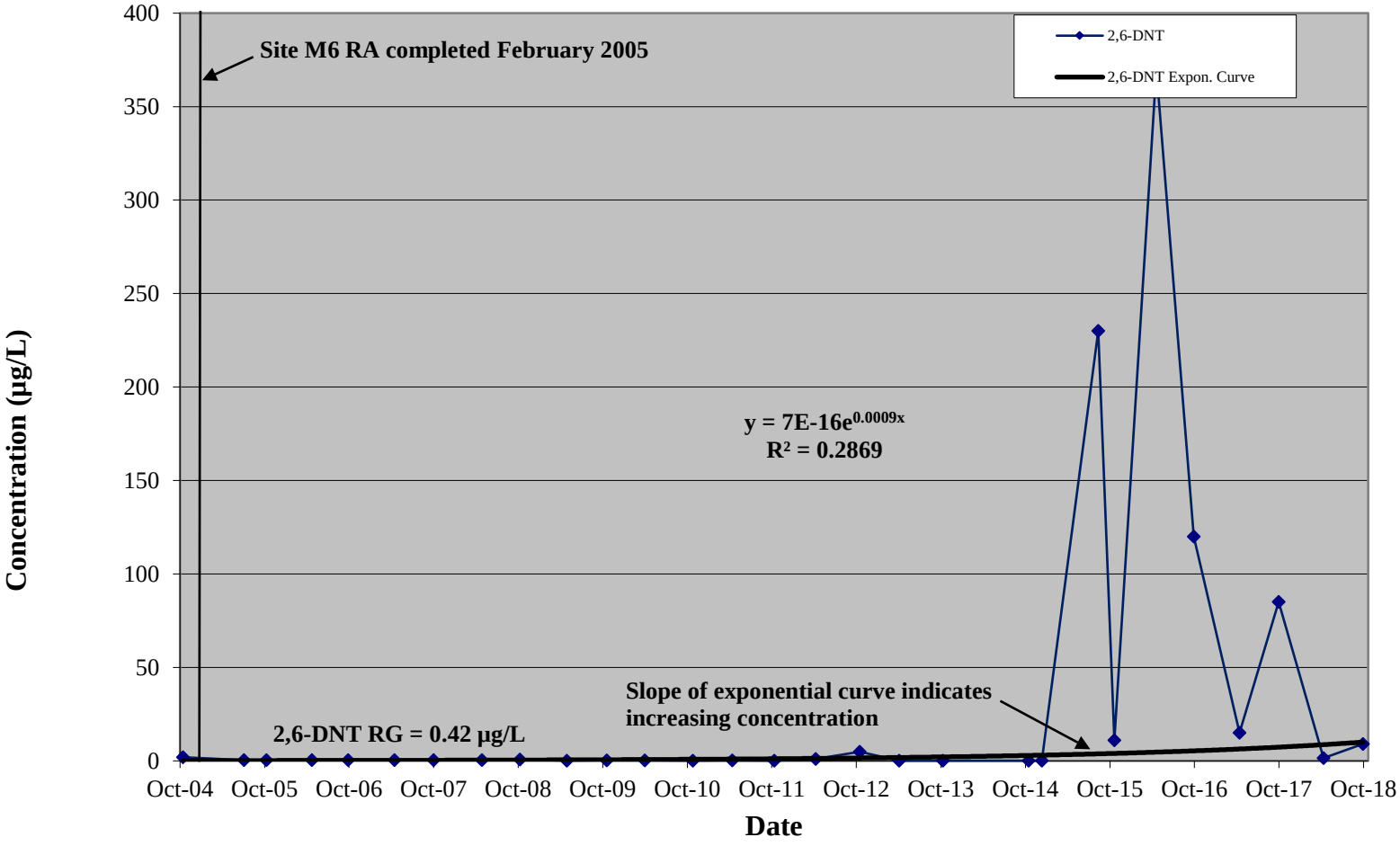

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FIGURE D-28

Site M6 - MW654
First Order Decay Rate Constant Estimation - 2,4,6-TNT
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant

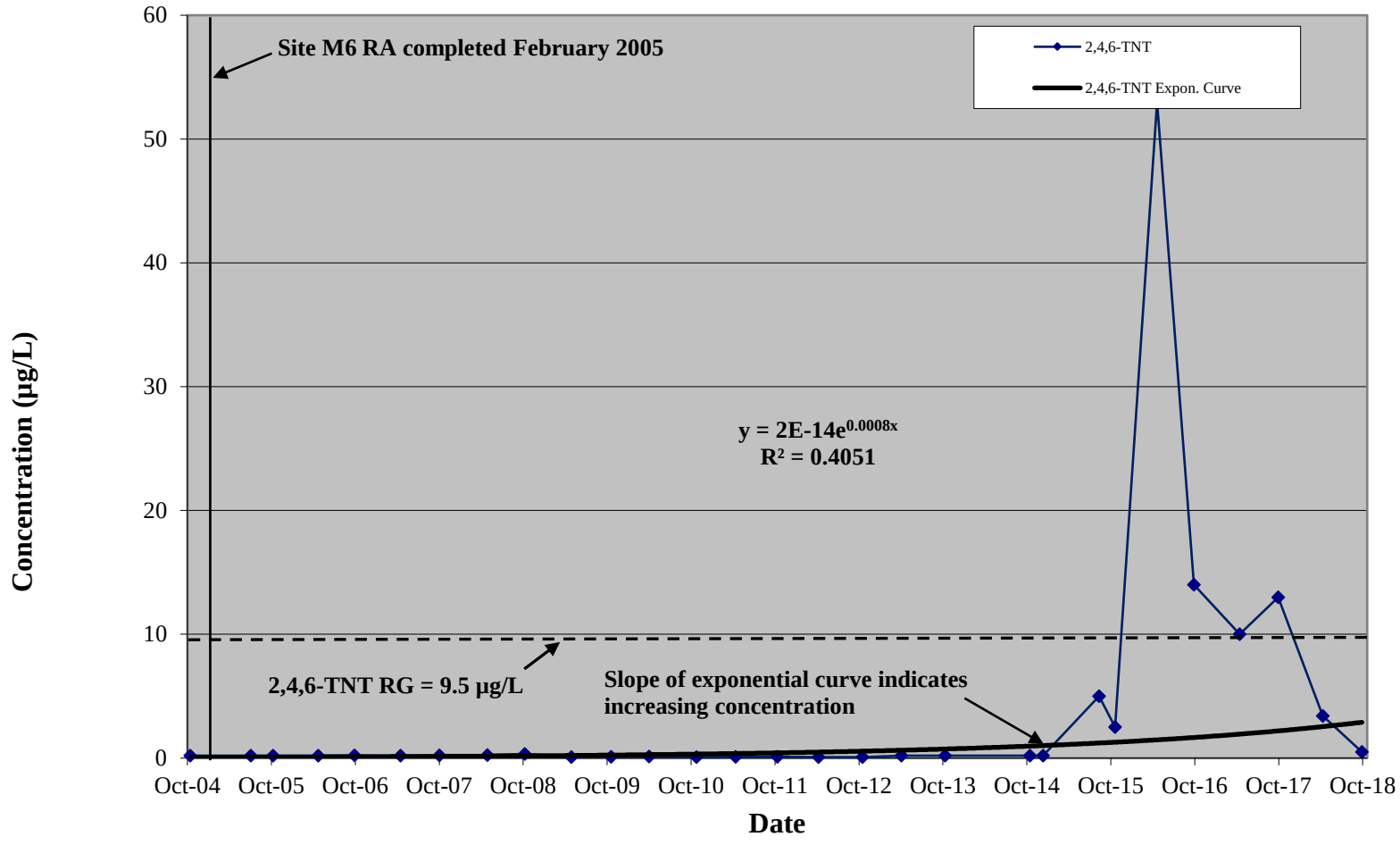

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FIGURE D-29

Site M13 - MW362
First Order Decay Rate Constant Estimation - 2,4-DNT
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant

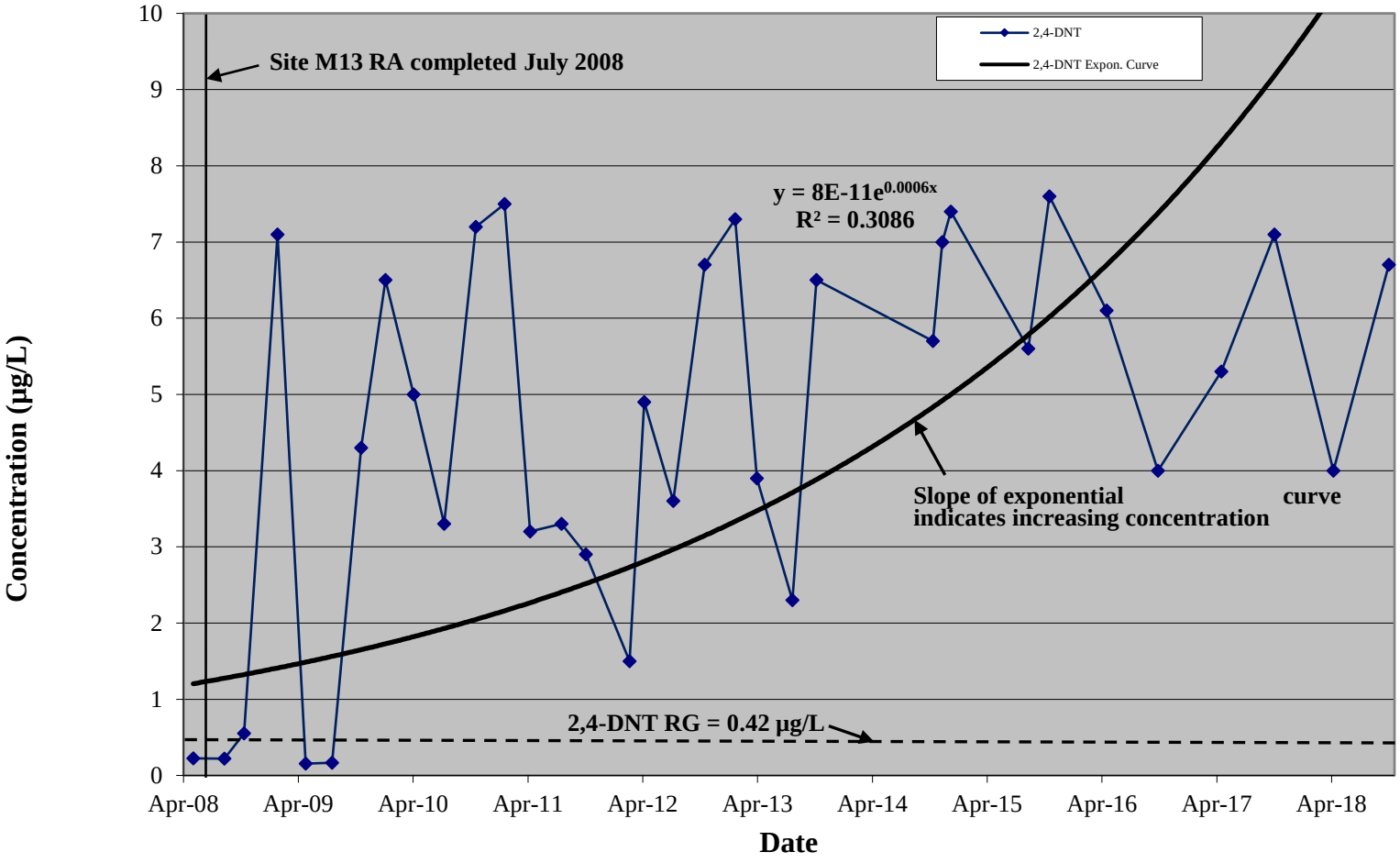

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FIGURE D-30

Site M11 - MW335
First Order Decay Rate Constant Estimation - Sulfate
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant

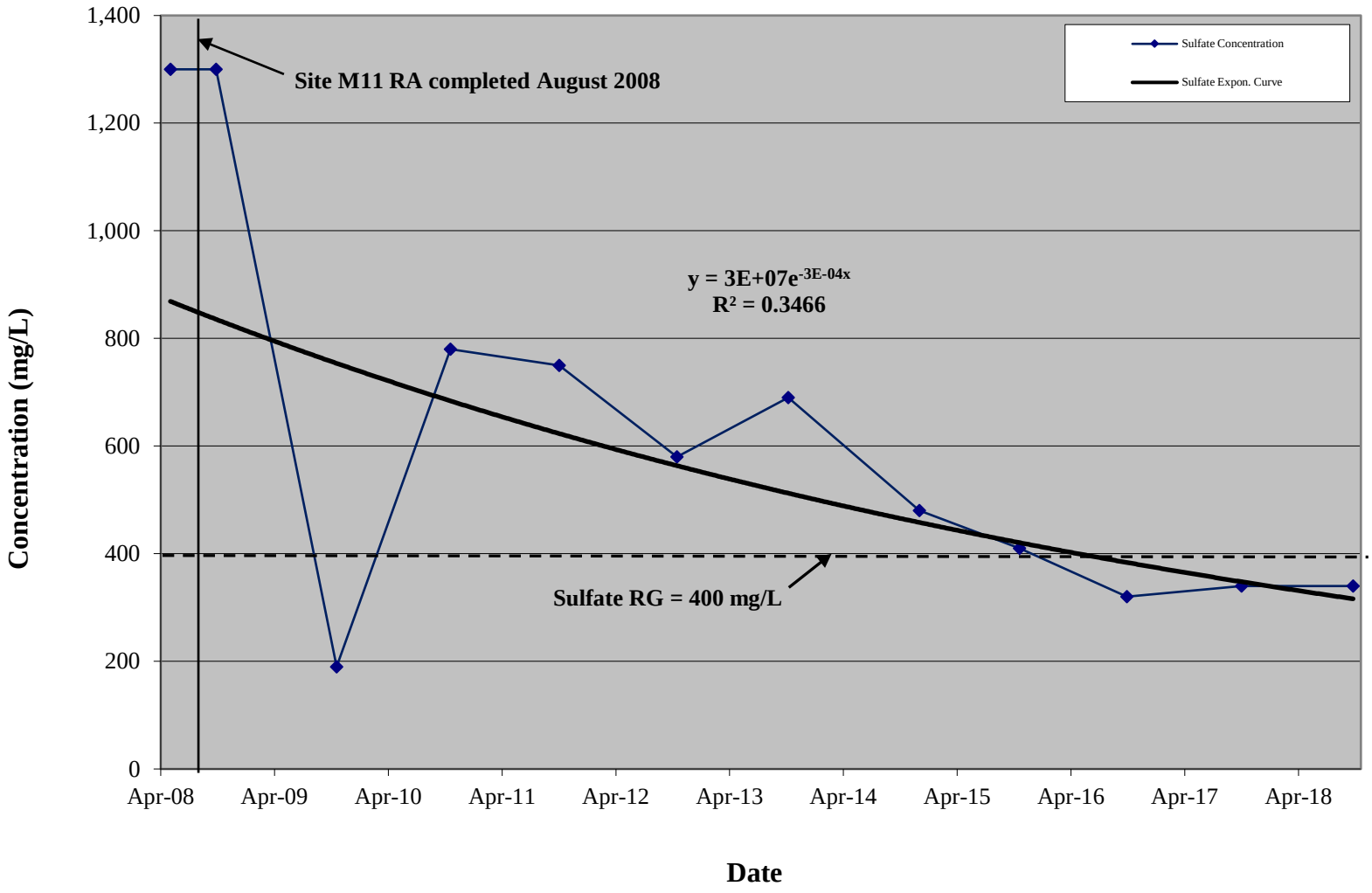

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FIGURE D-31

Site M11 - MW336
First Order Decay Rate Constant Estimation - Sulfate
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant

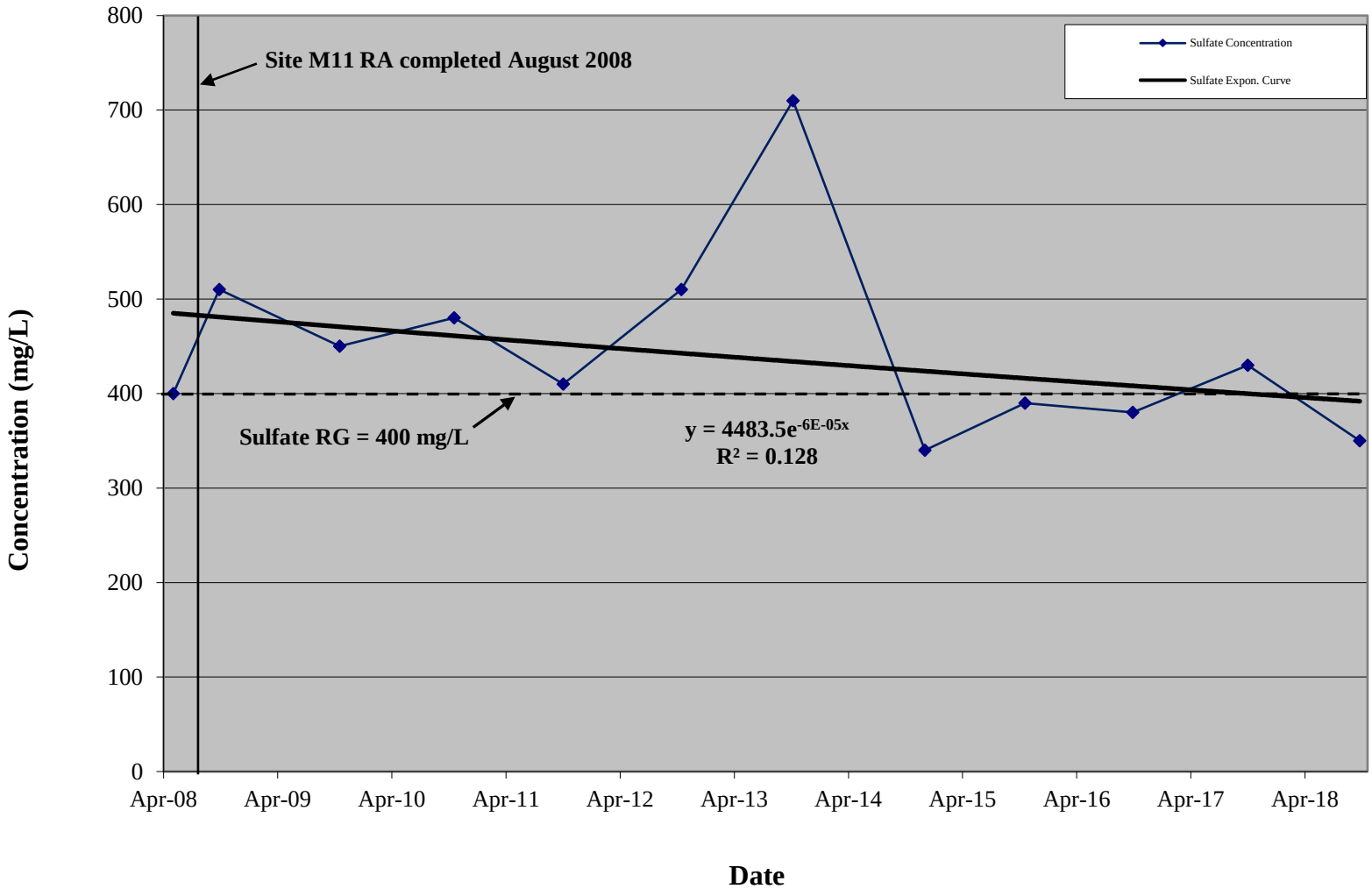

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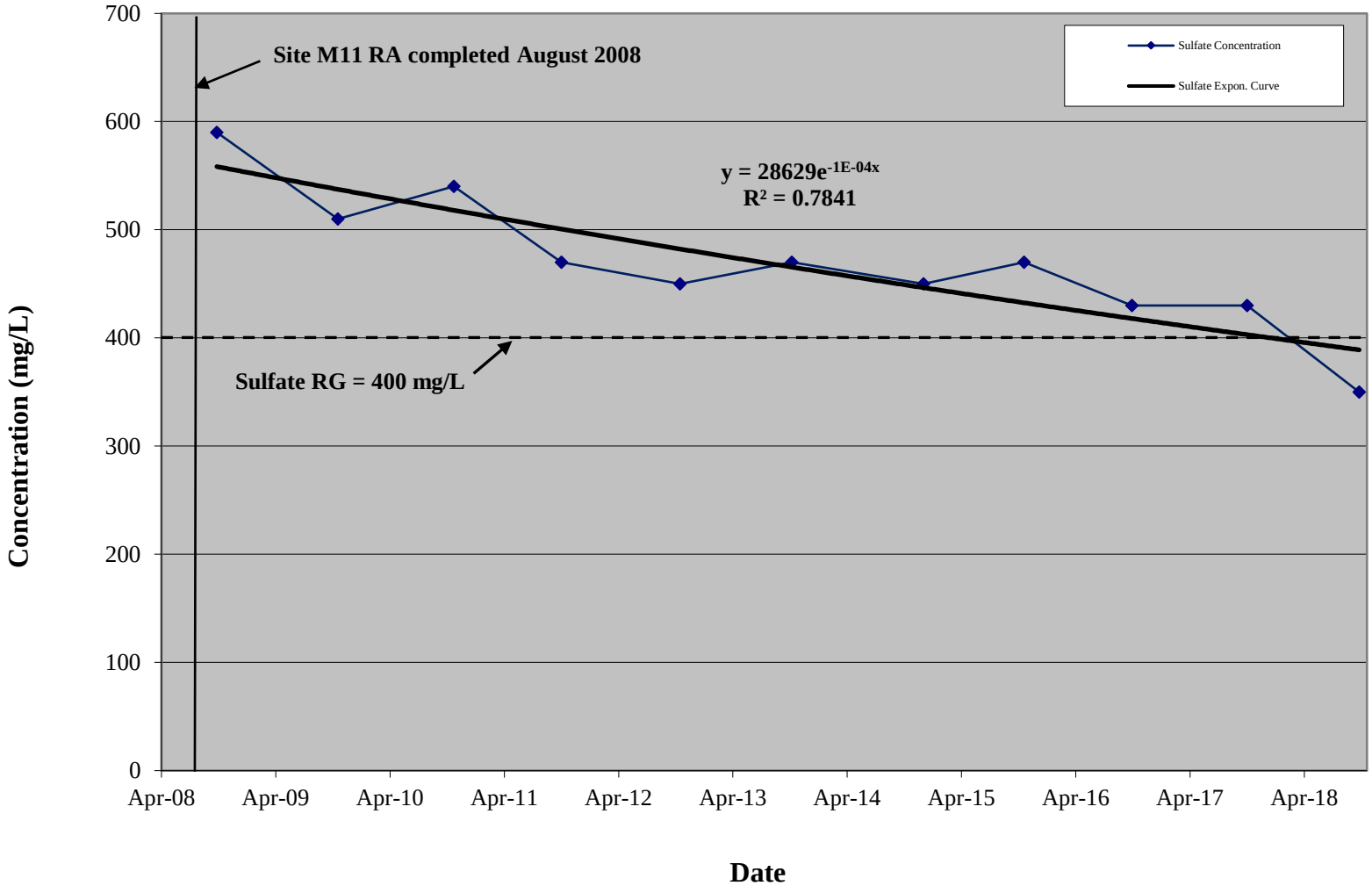
FIGURE D-32

Site M11 - MW805
First Order Decay Rate Constant Estimation - Sulfate
2018 Annual Groundwater Monitoring Report
Joliet Army Ammunition Plant



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D2 – ESTIMATED CLEAN-UP TIME: EXAMPLE CALCULATION

ESTIMATED CLEAN-UP TIME: EXAMPLE CALCULATION

The following example calculation illustrates the use of existing groundwater quality data to project future contaminant reduction rates. This analysis calculates the projected time at which the concentration of a selected compound in a selected well is reduced to its RG. However, based on the variability of the data, primarily due to seasonal fluctuations, the calculated cleanup times are only an estimate based on the data available. This particular example pertains to the reduction of RDX in well MW173 at Site L1 (Figure D-3). The end result of this calculation is shown in Table 3-6.

The contaminant reduction equation is based on the first order decay equation that describes biological degradation processes. This general equation is:

$$C_t/C_0 = e^{-kt}$$

where

C_t = concentration at time t
C_0 = concentration at time zero
k = decay rate
t = time t

This equation was then fit using a regression analysis to available concentration vs. time data for RDX (see Figure D-3 for data for well MW173 at Site L1).

Equation 1

Contaminant Reduction Equation: $C = 18805e^{-2E-04x}$

Where: C = contaminant concentration at time t
t = time after maximum concentration

In this regression analysis, the spreadsheet calculates a correlation coefficient (R^2). The closer R^2 is to 1.0, the greater the field data fit the first order decay equation describing biological decay. An R^2 value equal to 1.0 is an exact fit, and as values approach zero a poorer fit. R^2 values are displayed on the plots used for the expected clean-up time analysis. R^2 values range between approximately 0.1 and 0.5, mainly due to seasonal variations in the data. At MW173 the R value for RDX on Figure D-3 is 0.1433.

The goal of this analysis is to estimate the time (T) at which the contaminant concentration reaches the site RG. Therefore, the contaminant reduction equation is solved for T and Equation 1 becomes:

Equation 2

$$T = \frac{LN\left(\frac{C}{18805}\right)}{-0.0002}$$

In its simplest form, Equation 2 gives the concentration (C) at any time (T). With a few modifications, this relationship will yield the time (from present date) to clean-up. The information required for this calculation is obtained from Figure D-3.

Explosives Compound:	RDX
Maximum Concentration (C_o):	15 micrograms per liter (µg/L)
Date of Initial Concentration (To):	2007
Remediation Goal (C_{RG}):	2.6 µg/L

The following steps are performed to arrive at the time required for reduction of the contaminant to the site RG:

<u>Step 1</u>: Determine the time (T) required for the maximum observed (initial) concentration (C_o) to degrade to the RG (***C****RG*) for that particular compound. This is accomplished by using Equation 2 and calculating the difference in time (***T****total*) between a concentration at a selected point in time (***C****t*1 at time T1) and the RG (***C****RG*). This relationship is as follows:

Equation 3

$$\boldsymbol{T}total = \frac{LN\left(\frac{\mathbf{C}RG}{18805}\right)}{-0.0002} - \frac{LN\left(\frac{\boldsymbol{C}t1}{18805}\right)}{-0.0002}$$

Using ***C****t*1 = 15 µg/L in 2007, results in:

$$= \frac{Ln\left(\frac{2.6\frac{ug}{L}}{18805}\right)}{-0.0002} - \frac{Ln\left(\frac{15\frac{ug}{L}}{18805}\right)}{-0.0002}$$

T*total* ≅ 24 years after 2007

Note: ***T****total* represents the clean-up time in years past the time of ***C****t*1 (2007).

<u>Step 2</u>: Compute the time from the current reporting date (2018) to the time at which the RG is met. This would be:

Time from 2018 = ***T****total* - (2018-2007)

This example calculation would be:

24 years – 11 years = 13 years from 2018

The end result of this example calculation estimates that RDX at well MW173 (Site L1) may degrade to the site RG of 2.6 µg/L in approximately 13 years from the current reporting date, or in the year 2031 (Table 3-6). Based on the variability of the data, primarily due to seasonal fluctuations, the calculated cleanup times are only an estimate based on the data available. It should be noted that this is an approximation only and that there are several other variables not considered in this analysis that may alter the future trend in contaminant reduction.